

CONTROL AND QUALITY OF LIFE

Anxiety Sensitivity, Asthma Control, and Quality of Life in Adults with Asthma

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Objective. The aim of this study was to examine the role of anxiety sensitivity (AS) in terms of asthma control and asthma-related quality of life in a sample of adults with a physician-verified diagnosis of asthma. **Methods.** Self-report measures assessing psychological and asthma symptoms were mailed to 368 asthma patients from a community allergy and asthma office who had been seen for a physician follow-up visit between 1 January 2009 and 1 January 2010. Participants in the current study were 127 asthma patients (74% female; $M_{\text{age}} = 43.4$ years, $SD = 12.3$) who completed and returned the self-report measures. **Results.** The results indicated that, after controlling for gender, age, negative affect, and number of comorbid medical problems, the physical concerns factor of AS (AS-Physical Concerns) significantly predicted asthma control and all domains of asthma-related quality of life (symptoms, activity limitations, emotional functioning, and environmental stimuli). **Conclusions.** These findings replicate and extend previous research and indicate that the fear of physical sensations negatively affects both asthma control and quality of life. These findings also suggest that targeting the AS-Physical Concerns may be a novel way to improve asthma control and quality of life.

Keywords anxiety, anxiety sensitivity, asthma control, psychopathology, quality of life

INTRODUCTION

Despite the existence of a wide range of treatment options, 5–10% of asthma patients are unable to achieve significant asthma control (1). Researchers have identified the presence of comorbid psychopathology as an important contributor to poor asthma control. Indeed, individuals with asthma and a comorbid psychiatric diagnosis report poorer asthma control and quality of life compared with those without a psychiatric diagnosis (2–4). Although asthma often co-occurs with anxiety psychopathology, especially panic attacks and panic disorder (5, 6), there has been relatively little exploration of anxiety-related cognitive vulnerabilities as an explanatory factor for asthma-related outcomes.

One promising cognitive factor in this domain is anxiety sensitivity (AS), a trait-like cognitive characteristic defined as the fear of arousal-related physical and psychological sensations (7, 8). AS encompasses fears of physical, mental, and publicly observable anxiety experiences that load onto a single higher order factor (9–11). When individuals high in AS experience bodily sensations associated with autonomic arousal they become fearful, because they see these sensations as a sign of imminent harm with serious physical, psychological, or social consequences (12). In line with this theory, AS is concurrently and prospectively associated with an increased risk of anxiety symptoms and with the onset of certain anxiety

disorders (e.g., panic attacks, panic disorder, and posttraumatic stress disorder) (13–20).

Research examining AS and asthma, although limited, is promising. Specifically, independent of asthma severity, AS has been found to predict panic in response to asthma symptoms (21) as well as greater activity limitations due to asthma symptoms and poorer asthma-related physical and emotional health (22). Other work has found that patients with atopic (i.e., allergic or extrinsic) asthma have higher levels of AS than those with non-atopic (i.e., intrinsic) asthma (23). More recently, research has examined the role of AS in terms of asthma control. The findings from a pilot study examining the role of the three facets of AS (physical, social, and cognitive concerns) among an undergraduate sample with self-reported physician-diagnosed asthma indicated that the physical concerns factor of AS (AS-Physical Concerns), but not cognitive or social concerns, significantly predicted poorer levels of asthma control independent of gender, daily cigarette smoking, and negative affectivity (24).

Despite these promising results, there are several key limitations to previous research. First, research examining the association between AS and asthma control has focused on either adolescent (22) or undergraduate (24) samples. Thus, it is unclear whether these findings generalize to older samples. Second, in the aforementioned pilot study (24), asthma diagnosis was assessed via self-report only and there was no physician verification of the asthma diagnosis. Lastly, the effect of AS on asthma-related factors other than asthma control (e.g., functional impairment and quality of life) has not yet been studied among adults. Thus, the purpose of the current study was to replicate and

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extend previous research on AS and asthma by examining the unique predictive ability of AS in terms of (1) asthma control and (2) asthma-related quality of life among adults with a physician-verified diagnosis of asthma. It was expected that after controlling for gender, age, negative affect, and number of comorbid medical problems, the AS-Physical Concerns would significantly predict asthma control and the four asthma-related quality of life domains (symptoms, activity limitations, emotional functioning, and environmental stimuli).

METHODS

Participants and Procedure

Patients from a community allergy and asthma office who had a diagnosis of asthma were between the ages of 18 and 65, and those who had been seen for a physician follow-up visit between 1 January 2009 and 1 January 2010 were consecutively recruited to participate in the study. This resulted in the identification of a total of 368 potential participants. Study materials were then mailed out to these individuals. Specifically, individuals received (1) a letter that invited them to participate in the study and explained the study details; (2) a questionnaire packet; (3) two copies of the informed consent document (one to keep and one to return); and (4) a form on which to provide their mailing address in order to receive compensation. Interested participants provided written informed consent, completed the packet of questionnaires, provided their contact information, and then mailed all materials back to the asthma and allergy office in a self-addressed stamped envelope that was provided for them. A total of 127 questionnaire packets were returned (34.5% response rate). The Institutional Review Board approved all study procedures and materials prior to data collection.

Measures

Medical History Questionnaire. A checklist was employed to assess whether participants had ever been diagnosed with the following medical problems: arthritis/rheumatism, frequent or severe headaches, seasonal allergies, heart attack, high blood pressure, diabetes, HIV/AIDS, ulcers, back or neck problems, other chronic pain, stroke, heart disease, chronic lung diseases other than asthma, kidney problems, epilepsy/seizures, and cancer. The number of comorbid medical conditions endorsed was used as a covariate in the regression analysis to control for the effects of comorbid medical illness on asthma control and quality of life.

Positive and Negative Affect Schedule (PANAS). The PANAS (25) is a mood measure commonly used in psychopathology research (26). In this study, we used only the negative affectivity scale (PANAS-NA) as an index of the broad-based disposition to experience negative affective states (e.g., anger, anxiety, depression, and guilt). Internal consistency for the negative affectivity subscale in the current sample was good ($\alpha = 0.92$).

Anxiety Sensitivity Index-3 (ASI-3). The ASI-3 is an 18-item self-report measure that asks respondents to rate, on a 5-point Likert scale (0 = *very little* to 3 = *very much*), the degree to which they fear negative consequences stemming from anxiety symptoms (12). The ASI-3 measures three components of AS: physical, social, and cognitive concerns. Initial validation of the ASI-3 indicates that it possesses good convergent and discriminant validity (12). Based on findings from previous research (24), only the physical concerns subscale was used in this study. The physical concerns subscale contains eight items that measure the fear of arousal-related physical sensations (e.g., “It scares me when my heart beats rapidly”). Internal consistency in the current sample was good for the physical concerns subscale ($\alpha = 0.83$), and research supports the use of ASI-3 subscales as valid measures of specific anxiety-related concerns (12).

Asthma Control Test (ACT). The ACT (27) is a 5-item self-report measure that assesses asthma control. The ACT measures frequency of symptoms (e.g., “How often have you had shortness of breath?”) and functional impairment due to symptoms (e.g., “How much of the time did your asthma keep you from getting as much done at work or at home?”) within the past 4 weeks. Total scores range from 5 to 25 with higher scores indicating better asthma control (27–29). The ACT shows good reliability and is able to discriminate between groups of patients with different levels of asthma control (28). Internal consistency for the current sample was good ($\alpha = 0.89$).

Mini Asthma Quality of Life Questionnaire (MiniAQLQ). The MiniAQLQ (30) is a 15-item measure that assesses health-related quality of life. It is a shortened version of the well validated AQLQ (31). The MiniAQLQ measures four domains of quality of life impairment associated with asthma: (1) asthma symptoms (e.g., chest tightness); (2) activity limitations (e.g., exercising); (3) emotional functioning (e.g., frustration due to asthma condition); and (4) environmental stimuli (e.g., feeling bothered by or avoiding going outside because of weather conditions). Respondents are asked to rate on a 7-point Likert-type scale (1 = *severe impairment* to 7 = *no impairment*) the degree to which their asthma impaired their functioning in the past 2 weeks. The MiniAQLQ shows adequate correlations with the AQLQ ($r = 0.82$), has a good internal consistency for the global and subscale scores (range: 0.80–0.89), and is able to detect change over time (30). In the current sample, Cronbach’s alpha was 0.90 for the symptom subscale, 0.67 for the environmental stimuli subscale, 0.84 for the emotional functioning subscale, and 0.94 for the activity limitations subscale.

Analytic Approach

All analyses were conducted using Predictive Analytics Software, PASW (version 18.0, IBM). First, bivariate correlations were computed to examine the relationship between study variables. Next, multiple regression analyses were conducted to examine the incremental predictive validity of AS-Physical Concerns in terms of asthma

control and asthma-related quality of life. Separate models were constructed for each dependent measure (asthma control and four domains of asthma-related quality of life). Gender, age, negative affect, and number of comorbid medical problems were entered simultaneously as covariates at step 1. At the second step in the model, the main effect of the AS-Physical Concerns was entered into the model in order to estimate the amount of unique variance accounted for by this variable.

RESULTS

Participant Characteristics

The sample consisted of 127 non-smoking adults with physician-diagnosed asthma (74% female, $M_{\text{age}} = 43.4$ years, $SD = 12.3$). The racial composition of the sample was 78.7% Caucasian, 13.4% African American, 1.6% Asian, and 5.5% Other. About 26.8% of the sample had a 4-year college degree, 21.3% had a graduate degree, 17.3% had a 2-year college degree, 16.5% had completed some college education, 10.2% had a high school degree, 6.3% had completed some graduate education, and 1.6% had less than a high school degree. A total of 61.3% of the sample had well-controlled asthma, defined as having an ACT score ≥ 20 (27).

In addition to their asthma diagnosis, participants reported an average of 2.5 ($SD = 1.7$) additional medical problems. Specifically, participants reported the following lifetime history of medical problems: 90% reported seasonal allergies; 33.9% reported back or neck problems; 29.1% reported comorbid arthritis or rheumatism; 21.3% reported frequent or severe headaches; 18.9% reported high blood pressure; 17.3% reported experiencing chronic pain other than back or neck problems; 9.4% had been diagnosed with diabetes; 8.7% had been diagnosed with ulcers; 6.6% had been diagnosed with some form of cancer; 5.2% had been diagnosed with a chronic lung disease other than asthma; 4.2% had been diagnosed with kidney problems; 3.4% had

been diagnosed with epilepsy or seizures; 2.5% reported a history of heart disease; 1.7% had experienced a stroke; and 0.8% had a history of heart attacks.

Correlation and Regression Analysis

Table 1 summarizes the correlations among predictor and criterion variables. Neither gender nor age was significantly associated with any of the criterion variables. The number of comorbid medical problems was significantly negatively associated with all of the criterion variables (range: -0.21 to -0.33). Negative affect was significantly associated with all of the criterion variables except for quality of life related to environmental stimuli (range: -0.29 to -0.45). AS-Physical Concerns was significantly associated with asthma control ($r = -0.35$, $p < .01$) and each asthma-related quality of life domain (range: -0.43 to -0.53).

Table 2 summarizes the results of the multiple regression analyses. For asthma control, the first step accounted for 11.5% of the variance. Negative affect ($\beta = -0.26$, $p < .05$) was the only significant predictor at step 1; however, the results for number of comorbid medical problems approached significance ($\beta = -0.19$, $p = .057$). Step 2 of the model predicted 3.3% of unique variance and AS-Physical Concerns was a significant predictor ($\beta = -0.23$, $p < .05$).

In terms of symptom-related quality of life, the first step accounted for 20.2% of the variance. Negative affect ($\beta = -0.31$, $p < .05$) and number of medical problems ($\beta = -0.28$, $p < .05$) were the only significant predictors. Step 2 of the model predicted 5.5% of unique variance and AS-Physical Concerns was a significant predictor ($\beta = -0.29$, $p < .05$).

For activity limitations, step 1 accounted for 22.7% of the variance. Negative affect ($\beta = -0.35$, $p < .05$) and number of medical problems ($\beta = -0.28$, $p < .05$), but not age or gender, were significant predictors. Step 2 of the model accounted for 9.9% unique variance and AS-Physical Concerns was a significant predictor ($\beta = -0.39$, $p < .05$).

TABLE 1.—Descriptive data and intercorrelations among predictor and criterion variables.

	1	2	3	4	5	6	7	8	9	10	Range	<i>M</i>	<i>SD</i>
1. Age	—	0.35**	0.05	-0.20*	-0.05	0.02	-0.03	0.01	0.04	0.03	20–65	43.34	12.29
2. Medical problems ^a	—	—	0.00	0.12	0.20*	-0.22*	-0.33**	-0.32**	-0.21*	-0.26**	0–8	1.94	1.83
3. Gender ^b	—	—	—	-0.01	0.08	0.04	0.06	-0.05	0.03	-0.05	—	—	—
4. PANAS-NA ^c	—	—	—	—	0.53**	-0.29**	-0.35**	-0.39**	-0.45**	-0.16	10–48	17.95	7.47
5. ASI-PC ^d	—	—	—	—	—	-0.35**	-0.43**	-0.52**	-0.46**	-0.49**	0–24	6.28	4.95
6. ACT ^e	—	—	—	—	—	—	0.86**	0.68**	0.74**	0.55**	5–25	19.74	4.37
7. Symptoms ^f	—	—	—	—	—	—	—	0.76**	0.85**	0.65**	1.80–7	5.41	1.24
8. Limitations ^g	—	—	—	—	—	—	—	—	0.76**	0.65**	1.25–7	5.83	1.36
9. Emotions ^h	—	—	—	—	—	—	—	—	—	0.64**	1–7	5.21	1.52
10. Environment ⁱ	—	—	—	—	—	—	—	—	—	—	1–7	4.87	1.47

Notes: A single asterisk indicates correlation is significant at .05 level; double asterisk indicates correlation is significant at .01 level. AQLQ, Asthma Quality of Life Questionnaire.

^aMedical problems: number of medical problems.

^bGender: 1 = male, 2 = female.

^cPANAS-NA: Positive and Negative Affect Schedule-Negative Affect subscale (25).

^dASI-PC: Anxiety Sensitivity Index-Physical Concerns subscale (12).

^eACT: Asthma Control Test (27).

^fSymptoms: MiniAQLQ Symptoms subscale (30).

^gLimitations: MiniAQLQ Activity Limitations subscale (30).

^hEmotions: Mini AQLQ Emotional Functioning subscale (30).

ⁱEnvironment: Mini AQLQ Environmental Stimuli subscale (30).

TABLE 2.—Physical concerns factor of anxiety sensitivity (AS-Physical Concerns) predicting asthma control and asthma-related quality of life.

	ΔR^2	t (each predictor)	β	sr^2	p
Criterion variable: asthma control					
Step 1	0.12				<.05
Gender		0.14	0.01	0.00	ns
Age		0.29	0.03	0.00	ns
Negative affect		-2.68	-0.26	0.06	<.05
Medical problems		-1.92	-0.19	0.03	ns
Step 2	0.03				<.05
AS-Physical Concerns		-2.03	-0.23	0.03	<.05
Criterion variable: asthma-related quality of life—symptoms					
Step 1	0.20				<.05
Gender		0.55	0.05	0.00	ns
Age		0.05	0.01	0.00	ns
Negative affect		-3.57	-0.31	0.09	<.05
Medical problems		-3.12	-0.28	0.07	<.05
Step 2	0.06				<.05
AS-Physical Concerns		-2.88	-0.29	0.05	<.05
Criterion variable: asthma-related quality of life—activity limitations					
Step 1	0.23				<.05
Gender		-0.74	-0.06	0.03	ns
Age		0.40	0.04	0.00	ns
Negative affect		-4.08	-0.35	0.12	<.05
Medical problems		-3.13	-0.28	0.07	<.05
Step 2	0.10				<.05
AS-Physical Concerns		-4.07	-0.39	0.10	<.05
Criterion variable: asthma-related quality of life—emotional functioning					
Step 1	0.23				<.05
Gender		-0.01	-0.00	0.00	ns
Age		-0.18	-0.02	0.00	ns
Negative affect		-4.96	-0.43	0.17	<.05
Medical problems		-1.88	-0.17	0.03	ns
Step 2	0.06				<.05
AS-Physical Concerns		-3.02	-0.30	0.06	<.05
Criterion variable: asthma-related quality of life—environmental stimuli					
Step 1	0.11				<.05
Gender		-0.72	-0.06	0.00	ns
Age		0.87	0.09	0.01	ns
Negative affect		-1.13	-0.11	0.01	ns
Medical problems		-3.08	-0.30	0.08	<.05
Step 2	0.18				<.05
AS-Physical Concerns		-5.25	-0.52	0.18	<.05

Note: β , standardized beta weight; sr^2 , squared semi-partial correlation.

For emotional functioning, the first step accounted for 22.8% of the variance and negative affect was the only significant predictor ($\beta = -0.43$, $p < .05$). Step 2 of the model predicted 5.8% of unique variance and AS-Physical Concerns was a significant predictor ($\beta = -0.30$, $p < .05$).

In terms of environmental stimuli, the first step of the model accounted for 10.6% of the variance and number of comorbid medical problems was the only significant predictor ($\beta = -0.30$, $p < .05$). Step 2 of the model predicted 17.8% of unique variance and AS-Physical Concerns was a significant predictor ($\beta = -0.52$, $p < .05$).

DISCUSSION

As hypothesized, AS-Physical Concerns significantly predicted poorer asthma control and asthma-related quality of life. These results suggest that individuals with asthma

who report a fear of arousal-related physical sensations (e.g., increased respiration or heart rate) may be more likely to report poorer asthma control and lower levels of asthma-related quality of life. Specifically, in terms of quality of life, higher levels of AS-Physical Concerns were predictive of increased asthma symptoms and activity limitations, decreased emotional functioning, and a greater effect of environmental stimuli on asthma. These significant effects, accounting for 3.3–17.8% of unique variance, were over and above the effects of the theoretically relevant covariates of gender, age, negative affect, and number of comorbid medical problems. These results replicate and extend previous work (24) to an older sample with physician-verified (as opposed to self-reported) asthma diagnoses, as well as to a greater number of asthma outcome variables.

The results of this study suggest that the fear of anxiety-related physical sensations plays an important role in asthma management. It is noteworthy, however, that AS accounted for substantially less variance in asthma control in the current study when compared with earlier findings in previous research (24) (3.3% vs. 16%, respectively). This discrepancy may be due to the different methodologies employed; the earlier study relied on self-reported rather than physician-verified asthma diagnoses and did not control for the effects of comorbid medical conditions. Thus, the findings of the current study, though small, may be more meaningful given this more conservative test of the effects of AS-Physical Concerns on asthma control. These findings are further strengthened by the fact that the majority of participants in the sample had well-controlled asthma. One would expect even stronger associations among individuals whose asthma is not well controlled.

Further, these findings suggest that reducing AS, particularly the AS-Physical Concerns, in these individuals may be important for improving asthma control and asthma-related quality of life. Indeed, exposure-based techniques to reduce AS have been used to improve outcomes for other health problems (e.g., smoking cessation) (32). Future research should investigate the effect of reductions in AS on asthma-related variables as well as to examine the mechanism by which AS might influence asthma control and asthma-related quality of life. It is also likely that there are bidirectional associations between AS and asthma control and asthma-related quality of life. Thus, future studies should investigate how these asthma-related variables influence AS as well.

There are, however, a number of interpretive caveats to the present investigation that warrant consideration. First, the study sample was relatively homogenous in terms of gender and race (i.e., predominantly Caucasian women). Future studies investigating the effect of AS on asthma outcomes should include a more diverse population sample given that asthma is more prevalent among minority populations (33). Second, these results may have been influenced by a self-selection bias. The sample consisted of individuals who chose to complete and return the self-report measures for compensation and the response rate to the current study was relatively low (35.5%) compared

with what is typically found in studies in the social and behavioral sciences using similar methodology (55.6%) (34). Although we employed several techniques that have been shown to increase response rates (i.e., monetary incentives, stamped return envelopes, university affiliation), we did not contact participants prior to sending out the questionnaires or follow-up with non-responders (35). Thus, it is unclear whether these results are generalizable to the larger population of asthma patients.

Third, self-report measures were used as the primary assessment methodology, which does not protect against reporting errors and shared method variance. Further, conceptual overlap between asthma control and AS may influence their observed relationship, as individuals with high levels of AS may perceive their asthma to be poorly controlled simply because they catastrophize about their asthma symptoms. Although AS-Physical Concerns and asthma control were only modestly correlated ($r = -0.35$), it will nonetheless be important for future research to utilize objective measures of asthma control, such as peak flow measurement or spirometry.

Lastly, these findings were cross-sectional in nature. Future longitudinal studies are needed to document how AS might influence asthma control and asthma quality of life over time. Future research should also examine the effect of other health issues and behaviors (e.g., smoking) on the relationship between AS and asthma-related variables. Despite these limitations, the results of the current study highlight the importance of further examining the role of the AS-Physical Concerns in asthma-related outcomes and the potential utility for improving these outcomes through targeted interventions to reduce AS.

CONCLUSIONS

The results of this study suggest that individuals with asthma who endorse a fear of physical sensations may be “at risk” for poorer asthma control and decreased asthma-related quality of life. Developing interventions that target the AS-Physical Concerns may help to improve asthma management in this segment of the asthma population.

DECLARATION OF INTEREST

The authors report no conflicts of interest. The authors alone are responsible for the content and writing of this article.

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