Life Stress, Social Problem-Solving and Asthma

A Thesis

Submitted to the Faculty

of

Drexel University

by

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in partial fulfillment of the

requirements for the degree

of

Master of Science in Psychology

June 2010

Acknowledgements

I thank Dr. Christine M. Nezu, Dr. Arthur Nezu and Dr. Michael Sherman for their theoretical, conceptual, analytical and general support of this research. I also thank Dr. Michael Sherman, the fellows, residents and staff of the Hahnemann University Hospital's Division of Pulmonary and Critical Care Medicine Outpatient Clinic for their logistic support.

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Abstract

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Asthma is an immuno-inflammatory condition of the respiratory system. Clinical wisdom and previous scientific research suggest that life stress negatively impacts asthma. However, the nature of the stress-asthma relationship remains largely unclear. One hypothesis is that stress plays a multifaceted role, affecting asthma through the nervous and immune systems, and through behavioral pathways, such as disease self-management. Social problem-solving ability has been shown to play an important role in mediating the connections between stress and other chronic diseases, such as heart disease, diabetes and cancer. The coping abilities of individuals with asthma may also play a role as mediators of the stress-asthma relationship. The presented research is the first to examine the life stress and social problem-solving abilities of asthma patients in relation to their asthma control and asthma-related quality of life. The hypothesis that negative stressful life events would be associated with poor asthma control and asthma-related quality of life was not supported. Likewise, tests of the hypothesis that social problem-solving would mediate the stress-asthma relationship could not be conducted due to lack of statistical power. However, a statistically significant correlation was found between social problem-solving and asthma control and asthma-related quality of life. Problem-solving styles and asthma-related quality of life exhibited the strongest correlation. These results suggest that the social problem-solving framework is a

potentially important factor in asthma morbidity and may be potentially fruitful avenues for improving patient's capacity for successful asthma self-management.

Introduction

According to the World Health Organization, asthma currently affects 100-150 million people worldwide (WHO). The U.S. Center for Disease Control (CDC*)* found that asthma increased 75% from 1980 to 1994 in the United States. This increase in prevalence rate caused a doubling of annual number of visits to healthcare providers from 4.6 million to 10.4 million (CDC). Moreover, the CDC estimates that asthma causes more than 1.8 million emergency room visits per year. Asthma is common in adults (6.7%) and is the number one chronic condition in children (8.4%). Asthma now costs the United States over $13 Billion per year, more than the costs of HIV/AIDS and tuberculosis combined (CDC). Even though the number of deaths caused by asthma has decreased, it has yet to be adequately controlled (CDC).

Asthma can have a severely negative impact on quality of life. For example, people with asthma are less likely to engage in physical activity, such as exercise and household chores, are less likely to engage in social activities (Krahn, Berka, Langlois & Detsky, 1996) and are more likely to have anxiety and depressive disorders (Lavoie, Bacon, Barone, Cartier, Ditto & Labrecque, 2006). The burden of asthma is amplified by the chronic nature of the disease and the effort required to manage it. Successful asthma management requires that patients continually monitor their symptoms, take steps to avoid symptom triggers, consistently attend follow-up visits to their health-care provider, and adhere to demanding medication regimens (NIHLB, NIH 2007).

Asthma symptoms include airway inflammation, bronchiole constriction, excessive mucus production, wheezing, coughing, chest tightness and breathlessness

(Clark, Godfrey, Lee & Thomson, 2000). Because these symptoms occur as a result of a hyper-reactive and hypersensitive immune system, particularly dyregulation of the inflammation response, asthma is often referred to as an immuno-inflammatory condition (Nagai, 2005). Besides immune system dyregulation, asthma is also marked by an imbalance of the autonomic nervous system (ANS) (Clark et al., 2000). An imbalance of parasympathetic and sympathetic nervous system activity can result in over-constriction of airway musculature. It is the combination of inflammation and airway constriction that makes asthma so debilitating and dangerous.

As mentioned, asthma is a chronic condition. Even though symptoms may subside, the risk of symptom exacerbation often remains. Stimuli that elicit symptom exacerbations are called asthma "triggers". Triggers vary by individual, but often include allergens, such as pollen, pet dander and dust, and irritants such as, cigarette smoke and air pollution. Respiratory infections, exercise, and cold air are also triggers for many patients. The common feature is that they all elicit an immune response, or irritate the airways in someway that can result in symptom flare-ups.

Previous research literature indicates that psychological stress can also be a trigger for asthma symptoms (Clark et al., 2000). Psychological stress occurs when an individual perceives their circumstances to be threatening or beyond one's adaptive capacity (Cohen, Janicki-Deverts & Miller 2007). Psychological stress has been associated with activation of the sympathetic-adrenal-medullary (SAM) and activation of the hypothalamic-pituitary-adrenocortical (HPA) axis. These systems, when acutely activated, can increase an organisms chance of survival via increases in heart rate,

breathing, and blood circulation and decreases in less essential functioning, such as digestion. However, prolonged activation of these systems can interfere with other physiological functioning, contributing to and even causing biological disease (Cohen et al., 2007). Even though it not completely understood, it is believe that stress may contribute to asthma morbidity in that the same biological systems (SAM and HPA axis) that are associated with stress are known to affect the systems that are etiologically responsible for asthma (e.g. inflammation, airway muscle tone) (Clark et al., 2000). That being the case, stress is currently being researched as a risk factor for the development and progression of asthma.

Stress and Asthma

Research of the stress-asthma relationship is being conducted along numerous lines. Some investigations have focused on whether or not stress is associated with asthma-related healthcare utilization. For example, patients reporting to emergency departments with near fatal asthma have reported having more stressful lives than patients with less severe asthma (Mitchell et al., 2002). Likewise, asthma attacks have been found more likely to occur in the weeks following a negative stressful life event, such as death of a loved one (Sandberg et al., 2000). This was found to be especially true for individuals experiencing any sort of chronic stressor, such as physical abuse (Sandberg et al., 2000). Similarly, negative stressful life events have been found to be associated with decreases in asthma-related quality of life (Archea et al, 2008). Moreover, when negative life events occur in the context of pre-existing chronic stressors, the effect on quality of life is magnified (Archea et al., 2008). These findings

suggest that stress is a precipitating factor for asthma attacks, and that stress may also be a long-term risk factor.

Emerging research also suggests that the physiological changes associated with psychological stress can exacerbate the biological dysfunction associated with asthma. Specifically, stress has been shown to increase airway muscle reactivity and inflammation of the airways in response to triggers (Joachim et al., 2003, Forsyth et al., 2003). Likewise, stress has been shown to affect the autonomic nervous system, resulting changes in airway smooth muscle tone and reduced airflow in the lungs (Aboussafy, Campbell, Lavoie, Aboud, & Ditto, 2005 and Ritz et al., 2000). Other stress research has revealed that chronically stressed children with asthma have lower salivary a-amylase output, indicating lower sympathetic activity (Wolf, Nicholls &Chen, 2008). Reduced sympathetic activity may be partially responsible for symptom exacerbation by contributing to airway smooth muscle constriction.

In another area, environmental research has found that when children who have a chronic stressor in their lives are exposed to moderate levels of air pollution they exhibit more airway inflammation, more decreased lung function, and increased severity and frequency of asthma exacerbations than children without chronic stress (Chen, Schreier, Strunk & Brauer, 2008). These findings suggest that stress intensifies the immune response to airborne stimuli.

Other research has shown that negative stressful life events are associated with increased susceptibility to respiratory infection (Cohen, Tyrrell & Smith, 1993), which is one of the most common causes of asthma difficulties (McIntosh, Ellis, Hoffman, Lybass,

Eller & Fulginit, 1973). These results suggest yet another mechanism through which negative life stress contributes to poor asthma health.

Stress is also likely to affect asthma on a behavioral level. For example, adhering to prescribed medication regimens is crucial to successful asthma management (Bauman et al., 2002), but adherence may be negatively impacted by stress. Although the research of asthma medication adherence is somewhat lacking, other studies have found stress to be a risk factor for failures in adherence for other chronic conditions, such as diabetes (Peyrot, McMurry & Kruger, 1999, and Aikens, Wallander, Bell & Cole, 1992) and HIV (Gifford, Bormann, Shively, Wright, Richman & Samuel, 2000). In addition to deficits in medication adherence, stress can also affect asthma by increasing other negative health behaviors. Approximately 25% of people with asthma smoke cigarettes (Chaudhuri & Livingson, 2004). While under stress, asthma patients who do smoke, smoke more, despite their own self-report that it worsens their condition (Silverman, Boudreaux, Woodruff, Clark & Camargo, 2003).

Broadly speaking, psychophysiological and behavioral pathways provide some explanation of how stress affects asthma. However, the mechanisms through which stress negatively affects asthma requires further investigation. For example, research of the individual characteristics that render asthma patients more susceptible to the negative effects of stress is lacking. Social problem-solving (SPS) is one such set of characteristics that up until this study has not been researched in patients with asthma.

Social Problem-Solving

"Social problem-solving is the cognitive-behavioral process by which a person attempts to identify or discover effective or adaptive solutions to stressful problems encountered during the course of everyday living" (D'Zurilla & Nezu, 2007). In contrast to puzzle solving, and intellectual tasks used in experimental psychology, SPS refers to the self-directed efforts employed by an individual to cope with the real life situations that demand our attention. In other words, SPS theory provides an explanation for the ways people react to and attempt to manage the stress of real life.

SPS theory is based on the transactional and relational models of stress (D'Zurilla & Neuz, 2007). In these models, stress is not viewed as a stimulus or as a response per se, rather, stress is defined as an interaction between the person and the environment that is appraised as demanding, taxing or endangering wellbeing (Lazarus & Folkman, 1984). Transaction and relational models of stress recognize that an event that is stressful for one individual may not be stressful to another. It is the interpretation of the event that is important. The level of stress a person experiences depends on their perceptions of the events as well as their beliefs about their ability to cope with the event. The level of stress is further determined by how successful the individual is at creating and carrying out effective coping strategies. Similarly, the level of stress an individual may experience is also related to beliefs about their ability to effectively resolve problems. SPS is purported to play a major role in the environment-person interaction within these transactional/relational models of stress. The constructs contained within SPS, which will be discussed next, are thought to be integral in coping

with stress, and partially determine the extent to which life stress negatively impacts mental and physical health (D'Zurilla & Nezu, 2007).

SPS is comprised of two dimensions: problem orientation and problem solving style (D'Zurilla & Nezu, 2007). Problem orientation describes the ways an individual tends to view problems, manage their emotions, and their perceptions of their ability to cope. Individuals with a more positive problem orientation (PPO) view problems as a challenge, and as opportunities for benefit. People with a PPO also believe that problems are generally solvable and they have confidence in their problem solving ability. Individuals with a PPO understand that some problems take time and may involve negative emotions, but are committed to putting forth the effort and taking the steps necessary to effectively use their emotions to aid them in discovering effective solutions to the problem (D'Zurilla & Nezu, 1999). PPO is thought to be both constructive and adaptive.

Individuals with a negative problem orientation (NPO) tend to view problems as threats to their wellbeing. NPO is also characterized by doubt in one's ability to solve problems. Individuals exhibiting a NPO may also become easily frustrated and overwhelmed by negative feelings when attempting to solve a problem or cope with a stressor. Individuals with a more NPO are more likely to experience intensified and more chronic psychological and physical stress (D'Zurilla & Nezu, 1999). A NPO is considered to be dysfunctional and maladaptive.

Problem-solving style, the second component of the SPS framework, refers to the individual's attempts to manage or change one reaction to stress, and the actions

and thought processes engaged in to deal with stressful situations. Solving a problem in real life requires certain cognitions such as planning, generating possible solutions, comparing options and outcomes. It also requires outwardly directed actions aimed at resolving the problem. In addition, problem-solving in real life often requires the accurate interpretation, management and regulation of emotions.

Stress-related emotions can be both helpful and harmful. Stress and anxiety are commonly avoided, but these emotions can be informative, motivational and can help guide behavior. Coping styles that engage emotions in order to improve problem-solving ability are contrasted by a tendency to become overwhelmed by emotions and failure to see stress-related emotions as potentially informative and motivational. Poor interpretation and utilization of stress-related emotions can have many negative consequences such as less accurate problem definition, marginalized creativity, reduced capacity for engaging in constructive problem-solving and generally degraded cognitive capabilities. Problem-solving style in the SPS framework encompasses the behavioral and emotional aspects of coping with life stress and describes them using three problem-solving styles: rational problem-solving (RPS) which is constructive and adaptive, and two maladaptive styles, avoidant style (AS) and impulsive/careless solving (ICS).

RPS involves 4 problem-solving skills 1) accurate problem definition and formulation, 2) generating various approaches and possible solutions to the problem, 3) decision making, which involves the comparison and choosing of a solution, and 4) solution implementation and evaluation (D'Zurilla & Nezu, 1999). These skills, when

employed deliberately and in a timely manner, are more likely to lead to positive problem-solving outcomes, and therefore are linked to more positive emotions and reduction of problem-related stress. In contrast to RPS, AS and ICS problem-solving styles are considered maladaptive and when utilized are unlikely to end in effective problem solutions. AS describes precisely that, a tendency to avoid thinking about and dealing with problems. ICS is less avoidant but still maladaptive in that an approach to solving a problem may be selected in a reckless or hasty fashion often without consideration of the consequences or its potential effectiveness. The employment of AS and ICS problem solving styles often leads to ineffective problem remediation. Thus, individuals who engage in these maladaptive problem-solving styles are more likely to experience negative emotions, such as stress, and experience these emotions at a more intense and chronic level.

Past research suggests that maladaptive SPS can account for mental and physical health disorders. For example, maladaptive SPS has been correlated with depression (Priester & Clum, 1993, McCabe, Blankstein & Mills, 1999; Heppner & Anderson, 1985), anxiety (Nezu, 1986; Bond, Lyle, Tappe, Seehafer & D'Zurilla, 2002; Blankstein, Flett & Watson, 1992) and psychological distress (D'Zurilla & Sheedy, 1991). Negative problem orientation, in particular, has been shown to be a strong predictor of anxiety and depression (Elliot, Shewchuck & Richards, 2001; Nezu, & Ronan, 1985). Moreover, SPS has been shown to moderate the relationship between negative life stress and depression (Nezu, Nezu, Saraydarian, Kalmar & Ronan, 1986).

SPS research has also found that cardiac patients exhibiting more anxiety and depression also exhibited low-usage of problem-solving skills (Garcia, Valdes, Inmaculada & Riesco, 1994). Similarly, negative problem orientation has been shown to be a mediator of the relationship between stress and pain intensity and frequency (Nezu, Nezu & Jain, 2008, and Nezu et al, 2007). These findings illustrate that the variables within the SPS framework have wide-ranging implications for emotional and physical wellbeing. Additionally, SPS appears to be a central factor mediating the connection between psychological stress and physical symptoms. Since it has been useful in explaining the conditions through which stress becomes a negative factor in other health conditions, SPS may also be useful in understanding asthma.

Social Problem-Solving, Stress and Asthma

Asthma is a biopsychosocial condition characterized by a unique set of challenges and stressors: self-monitoring, medication adherence, seeking health-care, making and keeping follow-up appointments, avoiding triggers, and coping with the stress inherent in the physiological experiences associated with asthma (ie. difficulty breathing), just to name a few. The SPS framework affords a unique perspective from which to view asthma. It provides insight into how individuals outwardly deal with asthma *and* non-asthma-related problems. In addition, SPS draws a connection between emotional experiences, such a psychological stress and coping, and the biological underpinnings of asthma exacerbations.

By gathering information about the life stress of asthma patients, and data concerning their asthma-related quality of life and asthma control the presented

research will test the hypothesis that stress is associated with asthma morbidity. With the SPS framework in hand, this research also provides insight into some of the emotional and cognitive-behavioral variables that may be responsible for the translation of stress into poor asthma health.

Participants

Participants included 31 patients who had a primary diagnosis of asthma and were seeking care at Hahnemann University Hospital's Division of Pulmonary and Critical Care Medicine outpatient clinical (219 N. Broad Street Philadelphia, PA). Patients with any level of asthma severity were invited to participate. Participants were deemed ineligible if they had an existing or pre-existing psychological condition. Complicated cases such as those patients with more than one respiratory diagnosis were also excluded. Participation was completely voluntary. Participants were not financially compensated.

Methods

The presented research employed a cross-sectional design. The attending physicians and medical residents introduced participants to the student researcher. The participant was then given a brief overview and asked if they would be interested in participating. Those interested were escorted to a separate exam room dedicated to the study. Participants were given a comfortable and quiet place to sit. The student researcher then provided a more in depth description of the study, the consent form, the questionnaires and the nature of peak flow measurement. Participants then read, agreed to and signed a voluntary consent form. Meanwhile, the student researcher was

present to answer any questions. Upon consent, the participant filled out a series of self-report questionnaires assessing their experiences of stressful life events, their SPS abilities, and their current asthma control and asthma-related quality of life. Participants also provided their peak expiratory flow rate (PEFR).

Measures

Life Experiences Survey

Life stress was measured using the Life Experiences Survey (LES) developed by Sarason, Johnson and Seigel (1978). The LES includes 47 common life events such as death of family member, changing residencies, getting fired from a job, etc. Respondents indicated whether or not they have experienced the events in the past six months. The respondent also indicated how negatively or positively the events impacted their life. Ratings range from negative three extremely negative) to zero (no impact) +three (extremely positive). The LES also includes three blanks in which respondents can write-in experiences they feel are significant but were not included in the list of common events.

Social Problem-Solving Inventory-Revised: Short form

SPS was assessed using the Social Problem-Solving Inventory-Revised: Short form (SPSI-R:S) developed by D'Zurilla, Nezu & Maydeu-Olivares (2002). The SPSI-R:S is a 25-item self-report questionnaire that includes a scale for both dimensions of SPS: problem orientation and problem-solving style. The items are Likert-style and range from zero (Not at all true of me) to four (Extremely true of me). Higher total SPSI-R:S scores indicate more adaptive SPS tendencies and lower scores indicate more maladaptive SPS.

Scores from the different SPSI-R:S dimensions can also be analyzed separately. For example, responses for items eliciting information regarding NPO can be used in an analysis independent from PPO and problem-solving style.

Asthma Control Questionnaire

Well-controlled asthma is characterized by the minimization of symptoms, bronchoconstriction and minimal or no use of rescue medication. Asthma control is now considered to be the most central measure of asthma health (U.S. Department of Health and Human Services, 2007). Asthma control was assessed using the Asthma Control Questionnaire (ACQ) developed by Juniper, O'Byrne, Guyatt, Ferrie & King (1999). The ACQ is not an index of disease severity, rather a measure of the most clinically relevant aspects of asthma mentioned above. The ACQ uses a Likert-type scale to assess how often or to what degree the various aspects of asthma control are present. Lower are indicative of poor asthma control

The ACQ also includes assessment of the patient's peak expiratory flow rate (PEFR), a measure of lung function. The student researcher who had been trained to conduct PEFR measurements obtained the participants current PEFR. The procedure was first described to participant and then demonstrated by the student researcher. Using an nSpire Health "Pocket Peak Flow Meter" participants provided three PEFRs with time allowed in between for the patient to relax and regain normal breathing. The highest of the three PEFR readings was used to compare against each patient's "predicted score" which is based on healthy individuals matched on age, height, gender

and ethnicity. PEFR values that fall below the individuals predicted scores are said to be indicative of poor respiratory function and poorer asthma control.

Mini-Asthma Quality of Life Questionnaire (Short form)

Developed by Juniper et al. (1992), the Mini-Asthma Quality of Life Questionnaire (Short form) (Mini-AQLQ(S)) assesses the extent to which an individuals daily activities and routine are disrupted due to asthma. The Mini-AQLQ(S) measures the physical, emotional, occupational and social impacts caused by asthma. The items comprising the Mini-AQLQ(S) fall into four domains (symptoms, activity limitation, emotional function and environmental stimuli), which can be compiled or analyzed separately. Like the ACQ, lower scores on the Mini-AQLQ(S) indicate more impairment.

Previous research has shown that asthma control and asthma quality are somewhat independent constructs (Juniper, Wisniewski, Cox, Emmett, Nielson & O'Byrne, 2004). In other words, despite mild disease severity, some patients have a greatly reduced quality of life. Since they are somewhat independent constructs, it may be the case that asthma control and asthma-related quality of life are differentially affected by stress and SPS. Obtaining data on both measures of asthma health allowed for analyses capable of discerning these sorts of effects.

Hypotheses

Hypotheses for this research emerged from two basic premises: that experiencing negative life events is detrimental to asthma health and that an individual's SPS influences the extent to which negative life stress impacts asthma. Therefore, in accordance with the findings of Archea et al. (2008), the primary

hypothesis is that patients who report more negative impact from stressful life events will exhibit poorer asthma control and a more degraded asthma-related quality of life. The second hypothesis is that patients who exhibit maladaptive SPS scores will also exhibit poorer asthma control and a more degraded asthma-related quality of life. Furthermore, it is hypothesized that SPS is a mediator of the relationship between negative life impacts and asthma outcomes.

Data Analysis

The data analysis included single time point analyses: bivariate correlations, one-way ANOVAs, and linear regressions. The assumptions for conducting parametric correlations and one-way ANOVAs include: 1) continuous data, 2) normal distributions, 3) linearity and 4) homogeneity of variance. Besides the demographic variables, all data was continuous, interval data. Based on histograms, descriptive tests for skewness, and scatter plots, all data is normally distributed, linear and contains homogenous amounts variance. Given that all the assumptions were met, Pearson correlational analyses of life stress and asthma health were conducted to test the primary hypothesis. Pearson correlational analyses will also be used to test for a relationship between SPS and asthma; the second hypothesis.

One-way ANOVAs were conducted to test for group differences among asthma health, negative life impacts and SPS based on gender, ethnicity, medical history besides asthma, smoking status, education and income. Tests of the assumptions, as mentioned above, in addition to non-significant Levene's test, revealed normal distributions, and homogenous variance between all groupings.

Linear regressions assessed the extent to which life stress predicts asthma health. Additional regression and mediational analyses using the Sobel test would be conducted to test the hypothesis that SPS mediated the relationship between negative life impacts and asthma health. These data also met the assumptions of normal distribution, multicolinearity (Pearson correlations below .80), homogeneity of variance and multivariate linearity (based on collinearity diagnostics that revealed variance inflation close to one). However, tolerance levels were less than one, indicating that the predictor variables in the regressions were making only very small contributions to the variance in asthma health.

Results

Of the 31 participants, eight were excluded due to pre-existing psychological conditions, leaving data from 23 participants eligible for analysis. See Table 1 for demographic and health status data for the sample. Using One-Way ANOVAs, it was determined that no significant differences existed in the impact of negative life events nor number of negative life events in the past 6 months experienced across gender, ethnicity, medical history besides asthma, smoking status, education and income (see Tables 2 and 3).

Tests of the primary hypothesis that increases in negative life impacts would be associated with poorer asthma health yielded statistically insignificant Pearson correlations between negative life impact and both measures of asthma control and asthma-related quality of life (see Table 4).

The means and standard deviations for SPSI-R:S scores can be found in Table 5. Tests of the second hypothesis that maladaptive SPS would be associated with poorer asthma control yielded a number of statistically significant Pearson correlations (see Table 4). Tests of the second hypothesis that maladaptive SPS would be associated with reduced asthma-related quality of life yielded multiple statistically significant correlations at the $p < .05$ and $p < .01$ levels. Most notably, SPS total scores were significantly correlated with Mini-AQLQ(S) composite scores, $r(21) = .52$, $p = .010$ (see Table 4). Correlations between asthma control and asthma-related quality of life are presented in Table 4. Strong correlations were found between ACQ scores and the Mini-AQLQ(S) composite scores.

Social Problem-Solving Mediation of the Stress-Asthma Relationship

To test the hypothesis that SPS is a complete mediator of the stress-asthma relationship, according to Baron and Kenney (1986) it must 1) be determined that negative life impacts was an independent predictor of asthma control and asthma-related quality of life, 2) negative life impacts is correlated with the mediator (SPS), 3) SPS affects the outcome variable while controlling for negative life impacts, and 4) the effect of negative life impacts on asthma health while controlling for SPS is zero. If Steps 1-3 are met, but Step 4 cannot be, then SPS should be considered a partial mediator.

In Step 1 an individual linear regression analysis revealed that, at this point, negative life impacts could not significantly predict asthma control, $b = -.022$, $t(21) = -.72$, $p = .48$ or AQOL $b = -.053$, $t(21) = -1.27$, $p = .22$. A linear regression testing Step 2 indicated that negative life impacts could not significantly predict SPS Total, $b = -.080$,

$t(21) = -1.20$, $p = .24$. Since Steps 1 and 2 could be completed the mediational analyses had to be discontinued.

Discussion

SPS as a Mediator of the Stress-Asthma Relationship

Due to lack of statistical power, the hypothesis that SPS mediates the stress-asthma could not be tested. The most likely explanation for the lack of significant effect is the small sample size. Another possible explanation is that the LES does not assess the impact of all types of stressors. The LES targets only major life events. It is possible, and likely, that minor but more frequent daily stressors are also contributing to the physiological imbalances and self-management disruptions that lead to asthma exacerbation.

Relationship Between Social Problem-Solving and Asthma

The data collected thus far suggest that SPS is associated with asthma health. The statistical significance of the SPS-ACQ and SPS-AQOL relationships appear to be driven primarily by maladaptive problem-solving styles (ICS and AS). Participants who reported a greater tendency to employ irrational, careless, and avoidant-style approaches to solving life's challenges (i.e. failure to evaluate and compare possible solutions, spending more time avoiding problems than solving them, etc) also reported increased frequency of symptoms such as wheezing and coughing, awakening during the night due to asthma symptoms. These persons also reported increased use of rescue medication, decreased emotion-related quality of life, and increased activity limitation.

Since these conclusions are based simple correlations a cause and effect relationship could not be established. Still, the relationship between maladaptive problem-solving styles and poor asthma health is important. Employment of AS and ICS problem-solving styles are likely to translate into poor asthma self-management (i.e. failure to adhere to daily medication regime, seek follow-up appoints, etc). Hence these patients also reported poorer asthma control and degraded asthma-related quality of life. The relationship between maladaptive problem-solving styles and poor asthma health suggests that interventions that promote adaptive problem-solving styles may hold potential in terms of improving asthma morbidity.

Problem orientation was less correlated with asthma health. This may be due to lack of data but could be representative of the fact that asthma is not so much influenced by having a positive or negative attitude with regards to stress but is achieved through purposeful, outward and consistent self-management behaviors (factors more effectively measured by SPS problem-solving style subscales). Although, this is highly speculative and one should not infer that problem orientation does not play a role in asthma management. It is more likely that other factors associated with a positive problem orientation, such as higher degrees of self-efficacy and beliefs that asthma control can be achieved, support self-management behaviors. In fact, general and asthma-specific self-efficacy have been linked to improved asthma morbidity (Mancuso, Rincon, MCulloch & Carlson, 2001 and Wigal et al., 1993). Likewise, many asthma education programs include components that target these attitudinal factors.

The data also indicated that SPS is more strongly correlated to asthma-related quality than asthma control. One possible explanation is that the Mini-AQOL(S) assesses cognitive, emotional and behavioral aspects of the patients life, just like the SPSI-R:S. By contrast, asthma control is comprised solely of physiological phenomenon, such as asthma symptoms, need for rescue medication and lung function. These aspects of asthma health are further removed from any behavioral or emotional impacts that SPS may have on asthma health.

Limitations and Considerations

The most obvious limitation of the presented research is the sample size. The sample size severely limits the extent to which conclusions can be made, regardless of statistical significance. In addition to small sample size, the specific nature of the patient population may limit the generalizability of these findings. First, the great majority of the participants thus far have been female. Moreover, participants were recruited from only one pulmonary clinic. In addition, participants were recruited from only an outpatient setting. The target sample could be expanded to include individuals receiving in-patient care. Likewise, patients who have a history of psychological disorders such as anxiety and depressive disorders may also be included. The research will proceed at least through Summer 2010 in efforts to improve sample representativeness. Additional data will also increase sample size thereby increasing statistical power and the likelihood of detecting a relationship between stress and asthma, if one does exist.

Another limitation of the present study was the absence of medication adherence measurement. The extent to which patients adhered to their prescribed medications undoubtedly has an effect on how well the patient's asthma is controlled. The researchers took the stance that any variation in adherence would be spread out evenly across patients. In addition, medication adherence may be partially determined by stress (Bauman et al., 2002) and the patient's SPS, which were assessed.

Despite these limitations the data collected thus far supports the study hypothesis, albeit, to varying and sometimes statistically insignificant degrees. Mainly, a stress-asthma relationship has yet to be established using this research protocol. However, SPS and asthma health were significantly correlated. Problem-solving styles and asthma-related quality life exhibited the strongest and most consistent correlation. This correlation may reflect the many behavioral connections between SPS styles and asthma self-management. Patients who minimize their use of maladaptive SPS styles and more frequently engage in adaptive SPS styles may be more likely to improve their asthma-related quality of life.

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Table 1

Demographics and Health Characteristics (n = 23)

Gender	6 M; 17 F
Age (years)	
Mean	49.87
SD	15.16
Ethnic background	
African American	13
White	8
Asian	1
Multiple ethnicity	1
Education	
Some high school	4
High school	6
Some college	8
College degree	2
Graduate education	3
Income	
Less than $20,000	5
$20-$40,000	9
$40-$60,000	1
$60-$80,000	3
$80-$100,000	1
More than $100,000	3
Smoking status	
Current smoker	3
Non-smoker	23
Co-morbid medical history	
Cancer	1
Diabetes	3
Heart disease	5
Fibromyalgia	1
Arthritis	6
HIV/AIDS	1
Other	1
Actual PEFR (liters/minute)	
Mean	358.48
SD	125.86
Predicted PEFR (liters/minute)	
Mean	354.60
SD	94.40
Percentage PEFR	
Mean	1.03
SD	.31

Table 2

Analysis of Variance for Number of Negative Life Events (M = 4, SD = 3.48)

Source	df	F	Sum of Squares	*p*
		Between subjects		
Gender	1	1.21	14.43	.29
Ethnicity	3	1.31	40.31	.36
Medical history	1	1.41	16.73	.25
Smoking status	1	1.42	16.35	.24
Education	4	1.64	71.13	.21
Income	5	.39	28.27	.85

Table 3

Analysis of Variance for Impact of Negative Life Events (M = 8.26 SD = 8.24)

Source	*df*	*F*	Sum of Squares	*p*
		Between subjects		
Gender	1	1.43	95.37	.25
Ethnicity	3	1.27	249.24	.31
Medical history	1	1.05	71.43	.32
Smoking status	1	4.93	283.97	.07
Education	4	1.06	284.43	.41
Income	5	.56	217.63	.73

Table 4

Zero-Order Correlations for Asthma Patients

	ACQ	Mini-AQLQ(S)	NLE Impacts	SPS Total	PPO	NPO	RPS	AS	ICS
ACQ	---	.77***	-.15	.37	-.05	.11	.06	.37	.48*
Mini-AQLQ(S)		---	.22	.52*	-.07	.37	-.04	.51*	.62**
NLE Impacts			---	-.25	.09	-.31	-.17	-.17	-.12
SPS Total				---	.35	.75**	.52*	.60**	.56**
PPO					---	.16	.64**	-.38	-.32
NPO						---	.17	.39	.34
RPS							---	-.12	-.13
AS								---	.63**
ICS									---

* $p < .05$

** $p < .01$

Table 5

Social Problem-Solving Inventory-Revised: Short form

Subscale	Mean	Standard Deviation
SPSI-R:S Total	13.52	2.62
PPO	2.67	.86
NPO	2.76	.97
RPS	2.57	.88
ICS	2.58	.99
AS	2.9	.99