

Asthma Control on the Basis of Perceived Stress, Locus of Control, and Self-efficacy in Patients with Adult Asthma

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ABSTRACT

Objective: This study aimed to investigate the prediction of asthma control on the basis of perceived stress, locus of control, and self-efficacy in adult patients with asthma.

Methods: This was a descriptive-correlative and cross-sectional study. The selectivity of this study is all asthmatic patients in Tehran. Our sample consisted of 100 participants who were selected by purposeful sampling method. A total of 100 patients with asthma were selected among outpatients of Masih Daneshvari Hospital. Participants included 52 women and 48 men. Their mean (\pm SD) age was 36.12 (\pm 9.82) years. Sociodemographic data were collected and Perceived Stress Scale (PSS), Multidimensional Health Locus of Control (MHLC), Asthma Self-efficacy Scale (ASES), and Asthma Control Test (ACT) were applied. Data were analyzed by Pearson correlation and multiple regression analysis. Statistical analysis was performed using the SPSS ver. 16.0.

Results: The results indicated that there were negative significant relationships between perceived stress, dimension of external control (chance) and asthma control, but positive significant relationships between self-efficacy and asthma control. In regression analysis, the perceived stress was the predictor of asthma control.

Conclusion: In this study, our findings suggest that perceived stress has an important role in the development and maintenance of asthma symptoms. In addition, self-efficacy and a tendency to externally attribute the locus of control (chance) are significantly associated with asthma control.

Keywords:

Perceived stress, Locus of control, Self-efficacy, Asthma control

1. Introduction

Asthma is an altered immune system response that causes chronic inflammation of respiratory airways and bronchoconstriction. The diagnosis of asthma is based on history and measurement of pulmonary function using spirometry. Symptoms associated with asthma include dyspnea, wheezing, mucous drainage, cough, fatigue, and recurrent chest tightness (Womble, 2012). There is a rising burden of illness from asthma worldwide, and although most people develop asthma during childhood, adult-onset asthma is rather prevalent (Gibson, 2010).

In experimental studies, stress has been shown to accentuate the airway inflammatory response to irritants, allergens, and infections and, in doing so, increases the frequency, duration, and severity of the person's symptoms (Chen, 2007). How stress affects asthma is relatively well documented (Gibson, 2010), while sound prospective studies on the relationship between stress and incidence of asthma and other atopic disorders such as rhinitis and dermatitis are still few and the results are conflicting. A recent study from the UK reported an association between several psychosocial factors and asthma hospital admission, especially among patients with existing asthma (Wainwright, 2007). Another longitu-

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nal study found a broken life partnership, but not unemployment and death of a close person, to be associated with self-reported incident asthma in 4010 middle-aged Germans (Loerbroks, 2009). Neuroticism has been conceptualized as a stress-related personality trait and was found to be also associated with higher risk of asthma in this population. Spinhoven et al. showed that patients with high anxiety levels report more severe dyspnea than those with low anxiety. On the other hand, they demonstrated the same degree of histamine provoked bronchoconstriction (Spinhoven, 1997). Contrary to these result, Huovinen and colleagues found no effect of daily stress incidence of self-reported asthma among 11000 younger adults (18 to 45 years) in Finland (Huovinen, 2001; Rod, N. H., 2012).

The locus of control construct refers to the subjective beliefs of control that patients have over illness and health. Applying Rotter's social learning theory (Rotter, 1972) to the patients with chronic diseases, three different styles of health - and illness - related locus of control cognitions have been described, representing illness experiences and generalized expectancies of symptom control (Perrin, 1985). Internal locus of control represents the belief that one's own behaviour is regarded as important for one's state of health. This attitude is regarded as an essential precondition for active coping strategies both in patients with somatoform disorder and asthma. Powerful others externality means that powerful others, for example parents or physicians, are considered important for symptom control. This concept triggers the help-seeking behaviour of patients. Patients with chance health locus of control beliefs are convinced that their health status is influenced by fate, luck, or random events. Chance expectations are considered maladaptive in both somatoform disorder and asthma because of the associated passive patient behaviour (Schmitt, 1989; Goldbeck 2007). Studies showed that poorer health outcomes are associated with avoidant or maladaptive coping strategies and an external locus of control (Alto, 2001; Petrosky, 1991; Maes, 1987).

Bandura's theory of self-efficacy can be used to identify issues surrounding noncompliance in people with asthma and increase adherence to treatment interventions. Self-efficacy is the belief that one can actually perform such behaviours and skills that are believed to help (Hanson, 1998). Scherer and Schmieder (1996) reasoned that enhancing patients' levels of confidence is associated with increasing perceived self-efficacy. Asthma specialists suggest that focus on the behavioural factors that influence compliance to self-management of asthma could prevent deaths. Because there is no cure

for asthma, the role of the nurse practitioner is a multifaceted one and an ongoing process surrounding prompt response to acute exacerbation and control of chronic symptoms to prevent respiratory limitations and demise. The role of the nurse practitioner is to individualize an intervention program for clients with asthma focusing on raising self-efficacy expectations that can increase compliance. High levels of self-efficacy expectations are also associated with decreased symptoms, increased adherence to treatment, and increased self-care behaviours. One way to achieve behavioural changes is by increasing the patient's general and asthma specific self-efficacy expectancies (van der Palen, 1997).

2. Methods

This was a descriptive-correlative and cross-sectional study conducted on asthmatic outpatients of Masih Daneshvari Hospital, affiliated to Shahid Beheshti University of Medical Sciences, Tehran, Iran. The solecity of this study is all asthmatic patients in Tehran. The sample size in previous similar studies was in the range of 100-250 participants (Schneider, 2007; Furgal & Nowobilski, 2011). Therefore, our sample consisted of 100 participants who were selected by purposeful sampling method. All participants were informed about the goals of the survey and received the guidelines of filling out the questionnaire and then completed them. Inclusion criteria were having asthma based on the diagnosis of two allergy specialists and being 18 to 60 years old. Exclusion criteria were as follows: having an obvious mental disorder symptom according to the participant's self-report, younger than 18 and older than 60 years, having mental retardation, being illiterate, having other chronic diseases such as diabetes or cancer, and presenting invalid and incomplete information. Finally, data of 100 participants were used in the analyses. The study was approved by the local Ethics Committee. Assessment procedures were confidential. Psychological questionnaires were used only for statistical analyses and not for individual diagnosis.

Perceived Stress Scale (PSS): The Perceived Stress Scale (PSS) is the most widely used psychological instrument for measuring the perception of stress. It is a measure of the degree to which situations are appraised in one's life as stressful. Items were designed to tap how unpredictable, uncontrollable, and overloaded respondents find their lives. The scale also includes a number of direct queries about current levels of experienced stress. Moreover, the questions are of a general nature and hence are relatively free of content specific to any sub-population group. The questions in PSS ask about

feelings and thoughts during the last month. In each case, respondents are asked how often they felt a certain way. Items are rated on a 5-point agreement scale. The points corresponding to each level of the scale are marked with boldfaced brackets: (0), (1), (2), (3), and (4). Items number 4, 5, 6, 7, 9, 10, and 13 require reverse coding, which is reflected in their corresponding brackets. To compute the total assessment score, all scale items add up. Total scores ranges from 0 to 56. In 3 study for this scale the cronbach α were 0.84, 0.85, 0.86 computed (chohen 1983). In this study the cronbach α was 0.87.

The Multidimensional Health Locus of Control Scale (German version: KKG [22]) measures 3 dimensions of perceived controllability of individual health and illness symptoms: internal health locus of control, social external locus of control, and chance external locus of control. Each scale consists of 6 items with different perceptions of controllability of health- and illness-related aspects. The degree of assent to each statement has to be indicated by the respondent on a 6-point rating scale (1=do not agree to 6=agree very strongly). The questionnaire has been developed and validated with different clinical and healthy groups of children, adolescents, and adults. It has good reliability and validity. In our study, the internal consistency (α) was 0.72 for the socio-external scale, 0.51 for the chance-external scale, and 0.78 for the internal dimension.

Asthma Self-efficacy Scale (ASES) was designed by David Twain in 1987 to assess self-management skills of patients with asthma. This scale has 5 dimensions of asthma control, dealing with acute asthma attack, regular use of drugs (1 item), the stimuli and the environment (4 items), and the relationship with the doctor (4 items). Answers are rated on a 5-point scale, where 1 is low, 2 is moderate, 3 denotes in part, 4 is high, and 5 is complete marker of efficacy, while score 1 (not at all) was considered indicative of low self-efficacy. In 2013, Manijeh Ismaili examined the content and formal validity of the

questionnaire with ten faculty members of Tabriz University and some pulmonary specialists and considered their reviews. Finally, to check the reliability of the questionnaire, they showed them to 20 patients with asthma as well. The Cronbach α of this questionnaire has been reported to be 0.87. In the current study, the Cronbach α was 0.83.

This measure was not included in the previous review. It was developed with the aid of clinicians and patients (Nathan et al., 2004). Five items evaluate symptoms, role activities, and asthma control. Scores are obtained from 5-point Likert scale. Items are summed to yield a score ranging from 5 (poor control of asthma) to 25 (complete control). Optimal cut-off for well-controlled asthma has been reported as 20 or higher and poorly controlled as 15 or lower (Schatz et al., 2007b). Acceptable internal consistencies were reported at 0.84 by Nathan et al. (2004), 0.79 to 0.85 by Schatz et al. (2006, 2007b), and 0.89 by Wallenstein et al. (2007). Reproducibility (ICC) was reported as 0.77 (Schatz et al., 2006).

Statistical analyses were performed using the SPSS 16. our sample consisted of 100 participants who were selected by purposeful sampling method. In order to analysis the data, we used descriptive (mean and standard deviation) and inferential statistics (correlation and stepwise regression analysis). At first, Pearson correlation was assessed to examine the relationship between variables of the study. Then, a stepwise regression analysis was done to determine the proportion of each variable in explaining the variance of degree of asthma control ($P<0.001$).

3. Results

Table 1 shows the mean and standard deviation of scores obtained from perceived stress, locus of control, self-efficacy, and asthma control tests

Table 1. Mean and standard deviation of the variable scores.

Variable	Mean	SD
Perceived stress	20.28	9.22
Self-efficacy	70.41	9.83
Internal LOC	24.87	6.05
Powerful other LOC	29.51	4.10
Chance LOC	18.39	7.05
Asthma control	15.67	3.32

Table 2 shows a significant and negative correlation among perceived stress and chance health locus of control with asthma control that means higher scores in perceived stress and chance health locus of control are correlated with the lower scores in asthma control. Also, the results show that there is a significant and positive relationship between self-efficacy and asthma control. It means that higher scores in self-efficacy are associated with higher scores in asthma control.

Stepwise regression analysis was used to determine the proportion of perceived stress, internal LOC, powerful other LOC, chance LOC, and self-efficacy in explaining the variance of degree of asthma control. Results are summarized in Table 3.

At the first step we test multiple regression statistical assumption by checking for multivariate outliers with mahalanobis distance, collinearity statistics and our result showed that the tolerance of all the predictors are far in excess 0.01 and therefore suggest that multicollinearity is not a problem.

Table 3 shows that among the predictive variables, only the perceived stress, with the highest correlation with asthma control was used in the regression equation. The correlation between this variable and controlling asthma symptoms was $r=-0.35$, which explains 11% of the variance ($R^2=0.11$) of control asthma symptoms. It means that when the score of perceived stress increase on point, the mean of asthma control decrease 0.14 point.

4. Discussion

The recent study aimed to investigate the relationship between perceived stress, locus of control, and self-efficacy, with the degree of asthma control in adult asthmatic patients. Result showed a significant and negative

correlation between perceived stress, chance external locus of control and total score of asthma control. Also, there was significant and positive correlation between self-efficacy and total scores of asthma control.

Stress may affect the risk of asthma through various mechanisms, including alterations in airway structure or function and immune deregulation, psychological changes in perception of breathlessness, and adherence to treatment plan (Vig, 2006). Chronic stress can activate the neuroendocrine and sympathetic nervous system and through cortisol and catecholamine secretion exert an influence on the immune system (Wright, 2005; Montoro, 2009). This may lead to Th1/Th2 imbalance, which ultimately affects cytokine expression and favours an 'allergic' inflammatory response. Poor asthma control and compliance with treatment plans have been associated with a range of psychosocial problems (Bosley, 1995; Put, 2000; Lavoie, 2011), and one explanation for our findings with hospitalization may be that stressed individuals find it more difficult to manage their asthma and therefore are at higher risk of asthma hospitalization and fatal asthma (Montoro, 2009). However, the relationship between psychosocial factors and asthma fatality is still unclear, and a systematic review of psychological factors associated with near fatal and fatal asthma identified only 7 smaller case control studies with conflicting results (Alvarez, 2007).

Health locus of control is known as a variable influencing the development of health behavior and health capacity and explains known health problems. Internal locus of control goes positively along with the knowledge and attitudes of health, psychological health behaviors, and health status. In contrast, most external loci of controls (e.g. powerful others, chance) couple with negative health behaviors and are associated with poor psychological status (Malkin, Hamilton, 2005). The findings of this study are not supported by the theoretical basis of health locus of control. In general, very little research

Table 2. Result of pearson correlation test among all variables of the study.

Variable	Perceived stress	Self-efficacy	Internal LOC	Powerful other LOC	Chance LOC	Asthma control
Perceived stress	1	-0.424**	-0.518**	0.223*	0.463**	-0.350**
Self-efficacy		1	0.447**	-0.100	0.183	0.226*
Internal LOC			1	-0.070	-0.298**	0.173
Powerful other LOC				1	0.316**	-0.167
Chance LOC					1	-0.211*
Asthma control						1

* $P<0.05$, ** $P<0.01$

Table 3. Results of stepwise multiple regression for perceived stress, external and internal health locus of control and self-efficacy in predicting asthma control.

Model	Unstandardized Coefficients		Standardized Coefficients	T	P Value	Adjusted R ²
	B	Std.error	Beta			
Step 1	Perceived stress (constant)	-0.149 19.87	0.040 1.19	-0.350	-3.70 16.63	0.0001 0.114

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has been performed about the health locus of control in asthma control; however, looking at the framework of these variables, we observe that Waltson et al. mentioned the scale of health locus of control as a one-dimensional measure of the people's belief that whether their health is determined by their behavior. Waltson in his later studies stated that health locus of control scale shows that the selected health behavior is not predicted by the scores of health locus of control. He also observed that high internal scores predict the health behaviors when reinforcement was important. This theory supports the findings of the current study stating that the internal control does not have a meaningful correlation with the level of asthma control. The results of the study of Marius Forgal in 2011 showed that the sense of internal control does not necessarily protect the patient against the dyspnea-psychopathology correlation.

The result of this study also showed that there is a relationship between external health locus of control and asthma control. Asthmatic patients attribute their health to external factors such as powerful others or chance. Several studies support the causal role of external health locus of control in the development and persistence of asthma symptoms (Alison Pooler, 2009; Malcarne, 2005). The attribution of symptoms to fate or chance indicates a sense of lack of control on illness, and consequently high scores of fatalistic-external locus of control are rather expected correlated with passive illness behaviour and nonadherence to treatment. The belief that health cannot be controlled and fate or chance might be responsible for staying healthy or becoming ill, requires the awareness of limited personal power, because of their tendency towards concrete and rather egocentric thinking (Goldbeck, 2007).

On the other hand, the other findings of this study showed that there was a relationship between self-efficacy and asthma control. This finding is supported by previous studies (Lavoie, 2008; Gijsbers, 2008; Martin, 2009; Su-Yueh Chen, 2010). Although therapeutic advances in asthma have been made, compliance with long-term therapy is often poor, leading to significant morbidity and mortality (Nayak et al., 2000). Conway

surveyed 52664 patients and found a multitude of factors surrounding failure to adhere to treatment regimes. People felt that they wanted to save medications for bad attacks or thought that medications were not truly necessary (Conway, 1998). Compliance is undermined by lack of knowledge and inability to manage complex treatment plans. Evidence from research on Bandura's theory of self-efficacy suggests that relationships exist between self-efficacy and prevention.

Self-efficacy is an important component in the ability to manage asthma. High self-efficacy expectancies will result in better compliance towards self-management behaviours such as improved adherence to inhaled medications regimens. Zimmerman, Brown, and Bowman (1996) found that using a group teaching method to teach self-management skills improved self-efficacy levels.

Traditional outcome indicators such as health status and functioning are problematic in the context of rehabilitation of patients with chronic illness, because functioning may remain low even after successful intervention (Kole-Snijders et al., 1999; Lubkin & Larson, 2006). Furthermore, the aim of comprehensive and holistically orientated rehabilitation does not merely affect health, but rather facilitate the patient's adjustment to the illness and to find more effective ways of coping with its challenges and demands. Therefore, valid outcome measures for addressing coping are important for assessing interventions (Lubkin & Larson, 2006).

The study had some limitations. First, the conduction of the research at Masih Daneshvari Hospital was done under difficult circumstances. Sometimes, the patients had to fill out questionnaires within a crowded hospital that led to their poor concentration, and therefore affected the results of the study. Secondly, the education level of the patients was a decisive factor on the results, which the researcher faced while conducting the study. Answering this questionnaire for the patients with lower-than-average educational level was very difficult as a result of their weak ability to understand and comprehend the items of the questionnaire.

It is recommended that hospital personnel, especially nurses, acquire knowledge and skills of self-efficacy in controlling asthma symptoms to gain greater control of asthma, increase self-care behaviors and capabilities of patients as one of the necessary clinical interventions. They should educate and help patients understand that asthma is and can be controlled in most cases. Other recommendations of the research include execution of self-efficacy programs run by nurses at clinics associated with other chronic diseases extrusion. Furthermore, an assessment of psychosocial factors in the identification of high-risk patients could allow healthcare professionals to intervene earlier and thereby prevent onset and exacerbation of asthma attacks and other atopic disorders.

References

- Alto, A. M., Harkapaa, K., Aro, A. R., & Rissanen, P. (2001). Ways of coping with asthma in everyday life, validation of the asthma specific coping style. *Journal of Psychosomatic Research*, 53(6), 1061-69.
- Alvarez, G. G., & Fitzgerald, J. M. A. (2007). Systematic review of the psychological risk factors associated with near fatal asthma or fatal asthma. *Respiration*, 74(2), 228-36.
- Bosley, C. M., Fosbury, J. A., & Cochrane, G. M. (1995). The psychological factors associated with poor compliance with treatment in asthma. *European Respiratory Journal*, 8(6), 899-904.
- Chen, E., & Miller, G. E. (2007). Stress and inflammation in exacerbations of asthma. *Brain, Behavior, and Immunity*, 21(8), 993-9.
- Chen, S., Sheu, S., Chang, C., Chang, S., Wang, T., & Huang, M. (2010). The effects of the self-efficacy method on adult asthmatic patient self-care behavior. *Journal of Nursing Research*, 18(4), 266-73.
- Cohen, S., Kamarck, T., & Mermelstein, R. (1983). A global measure of perceived stress. *Journal of Health and Behavior*, 24, 385-96.
- Gibson, P. G., Donald, V. M., & Marks, G. B. (2010). Asthma in older adults. *Lancet*, 376(9743), 803-13.
- Gijsbers, B., Mesters, I., Knottnerus, J. A., & van Schayck, C. P. (2008). Factors associated with the duration of exclusive breast-feeding in asthmatic families. *Health Education Research*, 23(1), 158-69.
- Goldbeck, L., & Silke, B. (2007). Illness perception in pediatric somatization and asthma: complaints and health locus of control beliefs. *Child and Adolescent and Mental Health*, 1(1), 5. 10.1186/1753-2000.1-7.
- Hanson, J. (1998). Parental self-efficacy and asthma self-management skills. *Journal of the Society of Paediatric Nurses*, 3(4), 146-54.
- Huovinen, E., Kaprio, J., & Koskenvuo, M. (2001). Asthma in relation to personality traits, life satisfaction, and stress: a prospective study among 11000 adults. *Allergy*, 56(10), 971-7.
- Kole-Snijders, A. M., Vraeyen, J. W., Goossens, M. E., Rutten-van Molken, M. P., & Heuts, P. H. (1999). Chronic low back pain; what does cognitive coping skills training add to operant treatment. *Journal of Consulting and Clinical Psychology*, 67, 931-44.
- Lavoie, K. L., Bouchard, A., Joseph, M., Campbell, T. S., Favreau, H., & Bacon, S. L. (2008). Association of asthma self-efficacy to asthma control and quality of life. *Annals of Behavioral Medicine*, 36(1), 100-6.
- Lavoie, K. L., Boudreau, M., Plourde, A., Bacon, S. L., & Campbell, T. S. (2011). Association between generalized anxiety disorder and asthma morbidity. *Psychosomatic Medicine*, 73(6), 504-13.
- Loerbroeks, A., Apfelbacher, C. J., Thayer, J. F., Debling, D., & Sturmer, T. (2009). Neuroticism, extraversion, stressful life events and asthma: a cohort study of middle-aged adults. *Allergy*, 64(10), 1444-50.
- Lubkin, I. M., & Larson, P. D. (2006). *Chronic Illness, impact and interventions*. 6th edition. London: Jones and Bartlam Publishers.
- Maes, S., & Schlosser, M. (1987). The role of cognition and coping in health behaviour outcomes of asthmatic patients. *Current Psychological Research Reviews*, 6(1), 79-90.
- Malcarne, V. L., Hamilton, N. A., & Drahota, A. (2005). Children's health-related Locus of Control beliefs : ethnicity, gender and family income. *Child Health Care*, 34(1), 47-59.
- Mohajjel Aghdam, A., Hasankhani, H., Gharehmoammadlu, R., & Esmaeily, M. (2013). Relation of patient self-efficacy with control of asthma symptoms. *Journal of Gorgan University of Medical Sciences*, 15(2), 70-75.
- Montoro, J., Mullol, J., Jaurrui, I., Davila, I., Ferrer, M., Bartra, J., & et al. (2009). Stress and allergy. *Journal of Investigational Allergology and Clinical Immunology*, 19(Suppl 1), 40-7.
- Perrin, E. C., & Shapiro, E. (1985). Health locus of control beliefs of healthy children, children with a chronic physical illness, and their mothers. *Pediatrics*, 107(4), 627-33.
- Petrosky, M. J., & Birkimer, J. C. (1991). The relationship among locus of control, coping styles and psychological symptom reporting. *Journal of Clinical Psychology*, 47(3), 336-45.
- Pooler, A. (2009). *Exacerbations of severe asthma : Psychosocial predictors and the impact of a nurse-led clinic* (Doctoral Dissertation). UK: Keele University.
- Put, C., Van den Bergh, O., Demedts, M., & Verleden, G. A. (2000). Study of the relationship among self-reported non-compliance, symptomatology, and psychological variable in patients with asthma. *Journal of Asthma*, 37(6), 503-10.
- Rod, N. H., Kristensen, T. S., Lange, P., Prescott, E., & Diderichsen, F. (2012). Perceived stress and risk of adult-onset asthma and other atopic disorders: a longitudinal cohort study. *European Journal of Allergy and Clinical Immunology*, 67(11), 1408-14. 10.1111.1398-9995

- Rotter, J. B., Chance, J. E., & Phares, E. J. (1972). *Applications of social learning theory of personality*. New York: Holt, Rinehart & Winston.
- Mosen, D., Kosinski, M., Vollmer, W. M., O'Connor, E., Cook, E. F., & Zeiger, R. S. (2007). Validation of the asthma impact survey, a brief asthma-specific quality of life tool. *Quality of Life Research*, 16(2), 345-55.
- Schatz, M., Mosen, D. M., Kosinski, M., Vollmer, W. M., Magid, D. J., O'Connor, E., Zeiger, R. S. (2007). The relationship between asthma-specific quality of life and asthma control. *Journal of Asthma*, 44(5), 391-5.
- Schatz, M., Mosen, D. M., Kosinski, M., Vollmer, W. M., Magid, D. J., O'Connor, E., Zeiger, R. S. (2007). Validity of the Asthma Control Test completed at home. *American Journal of Managed Care*, 13(12), 661-7.
- Schatz, M., Mosen, D. M., Kosinski, M., Vollmer, W. M., Magid, D. J., O'Connor, E., & Zeiger, R. S. (2007). Predictors of asthma control in a random sample of asthmatic patients. *Journal of Asthma*, 44(4), 341-5.
- Schatz, M., Sorkness, C. A., Li, J. T., Marcus, P., Murray, J. J., Nathan, R. A., & et al. (2006). Asthma Control Test: reliability, validity, and responsiveness in patients not previously followed by asthma specialists. *Journal of Allergy & Clinical Immunology*, 117(3), 549-56.
- Schatz, M., Zeiger, R. S., Vollmer, W. M., Mosen, D., Apter, A. J., Stibolt, T. B., & et al. (2006). Development and validation of a medication intensity scale derived from computerized pharmacy data that predicts emergency hospital utilization for persistent asthma. *American Journal of Managed Care*, 12(8), 478-84.
- Schatz, M., Zeiger, R. S., Vollmer, W. M., Mosen, D., Mendoza, G., Apter, A. J., & et al. (2006). The controller-to-total asthma medication ratio is associated with patient-centered as well as utilization outcomes. *Chest*, 130(1), 43-50.
- Schatz, M., Zeiger, R. S., Drane, A., Harden, K., Cibildak, A., Oosterman, J. E., & Kosinski, M. (2007). Reliability and predictive validity of the Asthma Control Test administered by telephone calls using speech recognition technology. *Journal of Allergy and Clinical Immunology*, 119(2), 336-43. Epub 2006 Dec 27.
- Schatz, M., Zeiger, R. S., Mosen, D., & Vollmer, W. M. (2008). Asthma-specific quality of life and subsequent asthma emergency hospital care. *American Journal of Managed Care*, 14(4), 206-11.
- Scherer, Y. K., & Schmieder, L. E. (1997). The effect of a pulmonary rehabilitation program on self-efficacy, perception of dyspnea, and physical endurance. *Heart & Lung: The Journal of Acute and Critical Care*, 26(1), 15-22.
- Schmitt, G. M., Lohaus, A., & Salewski, C. (1989). Kontrollüberzeugungen und Patienten-compliance: Eine empirische Untersuchung am Beispiel von Jugendlichen mit Diabetes mellitus, Asthma bronchiale und Alopecia areata. *Psychotherapie, Psychosomatik, Medizinische Psychologie*, 39(1), 33-40.
- Spinoven, P., van Peski-Oosterbaan, A. S., Van der Does, A. J., Willems, L. N., & Sterk, P. J. (1997). Association of anxiety with perception of histamine induced bronchoconstriction in patients with asthma. *Thorax*, 52(2), 149-52.
- Van der Palen, J., Klein, J. J., & Seydel, E. R. (1997). Are high generalised and asthma-specific self-efficacy predictive of adequate self-management behaviour among adult asthma patients? *Patient Education and Counselling*, 32(Suppl. 1), 31-53.
- Vig, R. S., Forsythe, P., & Vliagoftis, H. (2006). The role of stress in asthma: insight from studies on the effect of acute and chronic stressors in models of airway inflammation. *Annals of the New York Academy of Sciences*, 1088, 65-77.
- Wainwright, N. W., Surtees, P. G., Wareham, N. J., & Harrison, B. D. (2007). Psychosocial factors and incident asthma hospital admissions in the EPIC-Norfolk cohort study. *Allergy*, 62(5), 554-60.
- Wallenstein, G. V., Carranza-Rosenzweig, J., Kosinski, M., Blaisdell-Gross, B., Gajria, K., & Jhingran, P. (2007). A psychometric comparison of three patient-based measures of asthma control. *Current Medical Research & Opinion*, 23(2), 369-77.
- Wallston, K. A., Wallston, B. S., & Devellis, R. (1978). Development of the Multidimensional Health Locus of Control (MHLC) scale. *Health Educ Monograph*, 6(2), 160-70.
- Wisnivesky, J. P., Lorenzo, J., Feldman, J. M., Leventhal, H., & Halm, E. A. (2010). The relationship between perceived stress and morbidity among adult inner-city asthmatic. *Journal of Asthma*, 47(1), 100-104.
- Womble, C. (2012). *Bandura's Self-Efficacy Theory in Asthma Compliance*.
- Wright, R. J. (2005). Stress and atopic disorders. *Journal of Allergy and Clinical Immunology*, 116(6), 1301-6.
- Zimmerman, B. W., Brown, S. T., & Bowman, J. M. (1996). A self-management program for chronic obstructive pulmonary disease: Relationship to dyspnea and self-efficacy. *Rehabilitation Nursing*, 21(5), 253-7.