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Multidimensionality of Childhood Asthma from the Behavioral Viewpoint

Keiko Nakano and Masaya Sato

Asthma has a multidimensional etiology and complex symptoms. Multidimensional factors are supposed to influence the course of childhood asthma. To assess the relationship between classical and operant conditioning, and the frequency of asthma symptoms, a stepwise discriminant analysis was employed. The age of onset, serum IgE concentration, and noncompliance for medical intervention were also included to obtain discriminant functions. The two most contributive factors to discriminating among the groups classified by the frequency of attacks and wheezing were classical and operant conditioning of asthma symptoms. The results supported the notion that the behavioral intervention programs should be multifaceted to change the course of childhood asthma.

KEY WORDS : Childhood asthma ; classical conditioning ; operant conditioning ; multidimensionality.

INTRODUCTION

Asthma is characterized by intermittent, variable, and reversible airways obstruction, producing the symptoms of wheezing, a sense of chest constriction, and frequent coughing and gasping (Chai, 1975 ; Creer, 1982). Asthma has not only a symptom complex, but also a multidimensional etiology, including infectious allergic, mechanical, and psychological factors. The complexity of asthma has contributed to the debate as to whether asthma is primarily a physiological or psychological disorder (Kagan & Weiss, 1976).

Asthmatic children are likely to have demonstrable allergies, and asthma attacks of children in common are produced by allergens (Siegel et al., 1978). The treatment for asthma is mostly pharmacological. New drugs such as disodium cromoglycate have been discovered and used to suppress the action of allergens and prevent attacks. Compliance with the medical regimens for asthma like other chronic diseases is, however, low. Appropriate compliance of medical intervention by asthmatic children and their parents has been demon-

strated to reduce the number and severity of asthma attacks (Fireman et al., 1981).

Although psychological factors are rarely assigned a primary etiological role, they appear to play a role in the course of asthma symptoms in some cases (Kagan & Weiss, 1976). The possibility that classical and operant conditioning may influence the behavior of an asthmatic has been speculated (Alexander, 1977). Asthma attacks are supposed to be triggered or maintained by behavioral factors in cases of specific individuals. Several studies demonstrated that the application of behavior therapy to behavioral patterns maintaining or related to asthma symptoms was effective (Alexander, et al., 1979 ; Creer et al., 1977 ; Renne & Creer, 1976 ; Yorkston et al., 1974).

The classical conditioning of asthma symptoms, however, has yet to be determined as possibility. One hypothesis is that the bronchospasm represents the reflexive allergic reaction to pollen, simply seeing grass should cause a conditioned bronchospasm (Alexander, 1977). It is also hypothesized that exercise may induce asthma attacks as a result of classical conditioning of bronchial airways (Khan & Olson,

1977). Any physical stimulus besides allergens may possibly play the same role of exercise as a conditioned stimulus. The evidence is not clear regarding either hypothesis of classically conditioned asthma.

The role of operant conditioning in maintaining asthma symptoms was suggested in a study (Neisworth & Moore, 1972). Asthma symptoms may be followed by strong reinforcements such as attention and affections of parents and peers. The asthma symptoms may also serve to avoid unpleasant situations (Turnbull, 1962). Despite the suggestion, it appears that few researches have been done to demonstrate the influence of operant conditioning to the course of asthma.

The course of childhood asthma is also influenced by other factors including age and sex of children, age of onset (King, 1980). The multidimensional feature of variables can be assessed by the use of discriminant analysis (Cooley & Lohness, 1971; Tastuoka & Tiedeman, 1954). In the present study, the relations among the dependent variables were analyzed in the three groups of asthmatic children classified by the frequency of asthma symptoms. The dependent variables were the age of onset, serum IgE concentration which is the index of allergic factor, the ratings of compliance for medical intervention, and the ratings of classical and operant conditioning factors. It was hypothesized that classical and operant conditioning factors relate significantly to the course of asthma symptoms. That is to say, both factors were expected to independently contribute to the course of asthma symptoms, along with other factors.

METHOD

Subjects

Sixty-one outpatients at the allergy clinic of the pediatrics at the National Defense Medical College Hospital, with the diagnosis of childhood asthma served voluntarily as the subjects. They had received medical treatments for more than three months. The subjects were classified into three groups according to the frequency of asthma attacks and wheezing. The first group (high frequency group) con-

sisted of 20 subjects who had had more than two attacks or ten days of wheezing in the last three months. They were 11 males and 9 females, and ranged in age from 4 to 13 years (M age=8.6, SD =2.87). Twenty-one subjects, 13 males and 8 females, assigned to a medium frequency group, whose age range was from 3 to 16 years (M age=8.7, SD =3.75). They had at least one attack, or they had wheezing of more than two days and less than ten days in the last three months. The third group (low frequency group) consisted of 20 subjects, 12 males and 8 females, who had had no attacks and less than two days of wheezing. The group ranged in age from 3 to 15 years (M age=9.0, SD =3.29). The frequency of asthma attacks and wheezing in the last three months was obtained from an asthma diary kept for clinical purposes.

Procedure

All dependent variables included in the study were collected through a clinical record, an asthma diary, and a behavioral checklist. The age of onset and the value of serum IgE concentration were obtained from a patient file. Noncompliance ratings for medical intervention were obtained from a mother's report in an asthma diary and were assessed by the irregularity of taking disodium cromoglycate for a month. When a patient did not take the drug correctly or forgot to take it, he or she received a point as noncompliance.

A behavioral checklist for the classical and operant conditioning related to asthma symptoms was developed. The behavioral checklist consisted of 21 items, derived from previous observations and interviews. A set of 11 items for classical conditioning examined on the asthma symptoms triggered by coughing, sneezing, yawning, shouting, laughing, crying, exercising, smoke, sudden temperature change, a definite place, and a definite situation. A subject received a point, when he or she was experiencing symptoms related to any one of these stimuli.

The other set of 10 items for operant conditioning assessed the parental reinforcing behaviors to asthma symptoms. The ten items were,

(a) spending more time with the child, (b) attending more to the child, (c) giving less parental discipline, (d) showing more affection, (e) paying less attention to the siblings of the child, (f) condoning the child's playing truant from school, (g) giving more favorite foods such as sweets, (h) permitting the child to watch television more, (j) any other parental behavior change with asthma symptoms of the child. Each item scored a point. The behavioral checklist was filled in by each mother of asthmatic children.

RESULTS

The means and standard deviations for the age of onset, value of serum IgE concentration, ratings of noncompliance for medical intervention, ratings of classically conditioned symptoms, and ratings of parental operant conditioning behaviors, are presented in Table 1. The correlation of each value with the foregoing variables is shown in Table 2.

Table 1

Means and Standard Deviations of Dependent Variables for High, Medium, and Low Frequency Groups

Group	Onset age	IgE	Noncompliance	Operant	Classical
High					
<i>M</i>	4.30	1614.60	3.45	6.60	6.40
<i>SD</i>	2.59	1310.57	1.19	2.37	2.08
Medium					
<i>M</i>	4.23	1465.71	3.00	3.57	3.42
<i>SD</i>	2.91	1432.51	1.41	2.69	2.01
Low					
<i>M</i>	4.30	1063.15	3.70	1.75	1.05
<i>SD</i>	2.40	875.73	1.45	1.40	1.05

Table 2

Correlations among Dependent Variables

	Onset	IgE	Noncompliance	Operant	Classical
Onset age	1.00				
IgE	0.13	1.00			
Noncompliance	0.01	0.07	1.00		
Operant	-0.10	0.18	-0.01	1.00	
Classical	0.13	-0.05	-0.15	0.12	1.00

The tests of Wilk's lambda by Rao's approximate *F*-test are presented in Table 3. It is shown that three groups, classified by the frequency of asthma attacks and wheezing, are different on three of five dependent variables. Three dependent variables are the ratings of classical conditioning, operant conditioning, and noncompliance.

Table 3

Results of Tests of Wilk's lambda by Rao's approximate *F*-test

Group	High frequency	Medium frequency
Medium frequency	$F=14.70$ $p<0.00$	
Low frequency	$F=39.76$ $p<0.00$	$F=7.61$ $p<0.00$

The weighted combination of three dependent variables providing maximum discrimination among the three groups is obtained by discriminant analysis and is presented in Table 4. The discriminant weights of the analysis indicate that the ratings of classical conditioning, ratings of operant conditioning, and noncompliance ratings contribute to produce group differences, consecutively. Only one set of significant discriminant functions was obtained ($\chi^2=68.079$, $df=6$, $p<0.00$).

Table 4

Standardized canonical discriminant coefficient

	Function 1
Noncompliance	0.09
Operant	0.52
Classical	0.80

DISCUSSION

This study was conducted to assess the influence of behavioral factors to the course of childhood asthma. Hypotheses derived from the perspective were tested by discriminant analysis. The significant differences on three dependent variables among three groups classified by the frequency of asthma symptoms suggest that classical conditioning, operant

conditioning, and noncompliance for medical intervention influence the course of childhood asthma. That is to say the asthmatic children, who have frequent attacks or wheezing, are likely to have classically conditioned symptoms and/or symptoms reinforced by parental attention or affections. Those children also seem to take disodium cromoglycate irregularly.

The discriminant coefficients indicate the relations among three dependent variables in discriminating the three groups. The classical conditioning factor was rated highest in relation to the frequency of asthma attacks and wheezing. The operant conditioning factor was secondly related, and noncompliance was thirdly related. The results suggest that the behavioral conditioning factors rather than other factors such as the age of onset and an allergy have stronger influence on the course of childhood asthma, when a patient has been medically treated.

The present study suggests that the behavioral intervention for asthmatic children will possibly change the course of the disease and reduce the frequency of attacks and wheezing. Most studies conducted on the behavioral treatment of asthma, however, employed relaxation training or systematic desensitization to reduce anxiety related to the symptoms (Knapp & Wells, 1978). King (1980) suggested the development of multifaceted intervention programs, contingent on the antecedents and consequences for the individual asthmatic child.

The results of this study supported the notion that the intervention programs for childhood asthma should be multifaceted. It is important to decondition asthma symptoms, induced by classical conditioning of the bronchial airways. Alteration of parental reinforcing behavior will be effective for ameliorating some cases of asthma. Behavioral programs to noncompliance for medical intervention will also assist to change the course of asthma. In this sample, noncompliance ratings were very low in all three groups of subjects. For a group of asthmatic children, intervention to increase compliance might be the most effective.

Finally, the findings reported in this paper

simply indicate the relations between the classical and operant conditioning factors and the frequency of asthma symptoms. Further research must be done to provide evidence for the antecedents and consequences relations.

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