

Original article

Clinical health education for patients with asthma-like symptoms but negative asthma tests

Background: Patients with asthma-like symptoms but negative asthma tests often state that they lack strategies to cope with their symptoms. The aim of the study was to determine whether a problem-based health education program had a beneficial effect on the participants' experience of symptoms and subjective health.

Methods: Thirty-eight patients, consecutively drawn from an outpatient clinic for asthma and allergy, were randomly allocated to an intervention group (I group, $n=18$) and a control group (C group, $n=20$). The I group, divided into three subgroups, met on seven occasions over 5 months. The program had a multidisciplinary approach, used exercises inspired by cognitive behavioral therapy, and was performed according to the principles of problem-based learning. All patients answered the Nijmegen Symptom Questionnaire (NQ) and the SF-36 health survey before and 2 months after the training was terminated.

Results: Before the program, there were no significant differences between the groups in their earlier experience of symptoms. After it, the I group scored significantly lower on shortness of breath ($P=0.001$) and central tetany ($P=0.05$) than the C group. On both test occasions, the asthma-like patients scored lower on all variables of the SF-36 than the reference groups of asthmatics and healthy subjects. No significant differences were seen between the I group and the C group except for vitality, in which the C group scored lower before the intervention.

Conclusions: Patients with asthma-like symptoms but negative asthma tests benefit from taking part in a problem-based health education program. It mainly reduces the frequency of symptoms.

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Patients suffering from asthma-like symptoms but in whom the results of lung-function tests do not support a diagnosis of asthma have previously been described with respect to medical, psychological, and social aspects (1–8). The disorder incapacitates the patients, and they state that they have few strategies to cope with the disorder and the situation (3).

Traditional asthma treatment using steroids and β_2 -stimulants has a poor effect, and no other pharmacologic treatment is available for these patients. However, in the rehabilitation of patients with diffuse disorders, syndromes, or multisymptoms, it has been reported by several authors that a multidisciplinary approach is beneficial (9–17). It has also been found important not only to discuss the symptoms from a medical perspective but also to include physiological, psychological, and social aspects of the patient's situation. Such multidisciplinary rehabilitation programs have been successfully accomplished in patients with clinically verified asthma (9, 10), pain and musculoskeletal disorders

(11–14), diabetes (15, 16), and arthritis (17). An earlier study observed that patients with asthma-like symptoms but negative asthma tests are at risk of entrapment in a dysfunctional way of thinking, leading to a vicious circle (3). In this situation, to encourage the patients to find new patterns of reasoning, exercises inspired by cognitive behavioral therapy would appear in theory to be potentially useful (18). Moreover, the problem-based learning (PBL) model for health education (19, 20) can be employed to motivate the patients themselves to seek knowledge about health issues relevant to the understanding of their symptoms. This method has been successfully used in the rehabilitation of patients with musculoskeletal pain (21). We therefore asked whether a health education program combining PBL and cognitive therapy could have a beneficial effect on the patient's experience of symptoms and health-related quality of life.

The overall aim of the study was to evaluate such a program for patients with asthma-like symptoms but negative asthma tests. The specific aim was to determine

whether the program had a beneficial effect on the patients' experience of symptoms and their general subjective health.

Material and methods

Study subjects

For inclusion in the study, the patients were required to have asthma-like symptoms but negative asthma tests. The following nine criteria had to be met:

- 1) lack of reversibility, defined as an increase of forced expiratory volume in 1 s (FEV₁) or peak expiratory flow rate (PEFR) values after inhalation of a β_2 -stimulant <10%
- 2) normal FEV₁ or PEFR values before inhalation of a β_2 -stimulant, defined as $\geq 90\%$ of predicted normal
- 3) a negative methacholine test, defined as PC₂₀ ≥ 8 mg/ml (22)
- 4) variability <20% of the PEFR values
- 5) negative skin prick tests
- 6) no smoking for at least 1 year prior to the study
- 7) birth in Sweden and fluency in the Swedish language
- 8) no other disease that could have an impact on respiratory function or any other vital function
- 9) presence of the symptoms for at least 2 years.

Seventy-two patients diagnosed as nonasthmatics and fulfilling these inclusion criteria were consecutively drawn from those who had been referred to an outpatient clinic for investigation of suspected asthma. Among these, six did not live in Göteborg, five were foreigners, six had another disease that could have an impact on their respiratory function, six had no symptoms for the moment, and nine did not want to participate in the project. These patients probably did not bias the selection of patients. The remaining 39 subjects were randomly allocated to two groups, an intervention group (I group, $n=19$), comprising three men and 16 women, and a control group (C group, $n=20$), comprising five men and 15 women (Table 1). One woman did not adhere to the program and was therefore excluded from the I group and the study. Thirty subjects had never smoked, and eight, four in each group, were ex-smokers. All patients were prescribed inhalation of a β_2 -stimulant, and none were on steroids. The study was approved by the Research Ethics Committee of Göteborg University.

Four reference groups (Table 1) were employed. Regarding reported symptoms, there were A group – patients with asthma (six men and 34 women, $n=40$) – and H group – healthy subjects (five men and 35 women, $n=40$); regarding the health survey, there were patients with asthma (11 men and 29 women, $n=40$) and a population of healthy subjects (4268 men and 4582 women, $n=8930$) (23).

Procedure

The I group was divided into three subgroups in order to achieve optimal conditions for group learning and the highest possible attendance. They met for 2 h on six occasions every other week for 3 months and on a seventh occasion after another 2 months. Questionnaires were filled in before the health education started and 2 months after its termination. All the patients answered the Nijmegen symptom questionnaire (NQ) (24–26) and the SF-36 health survey (27). The patients of C group visited the clinic and answered the questionnaires.

Self-rating of health-related quality of life and assessment of symptoms

The following self-administered questionnaires were used.

The Nijmegen Symptom Questionnaire (NQ) (24–26). The NQ

consists of a 16-item list of sensations, described as symptoms provoked by hyperventilation. It measures the frequency of symptoms experienced during daily life. Before the rehabilitation, the patients were asked how often they had experienced the symptoms earlier. Two months after the rehabilitation had been accomplished, the patients were asked to state the frequency of symptoms during the last 2 months. The answers to the 16 items of the questionnaire were graded as follows: 0=never occurring, 1=rare, 2=sometimes, 3=often, and 4=very often. By factor analysis of the items, the symptoms can also be grouped into the following three components:

- 1) *shortness of breath* (feeling of tenseness, shortness of breath, accelerated/deepened breathing, feeling unable to breathe deeply, palpitations, constricted chest, and chest pain)
- 2) *central tetany* (chest pain, dizziness, blurred vision, confusion, and sensation of bloated abdomen)
- 3) *peripheral tetany* (stiffness of fingers or arms, cold hands or feet, tightness around the mouth, and tingling fingers) (25).

“Chest pain” is included in two of the components. “Anxious feelings” was not included in any of the three components and is therefore here described as a fourth, separate category (25). In this study, the symptoms were analyzed in only these four components. The role of hyperventilation has earlier been investigated in patients with asthma-like symptoms but negative asthma tests (4).

The Short-Form-36 (SF-36) Health Survey (23, 27). Health-related quality of life is here measured by self-rating in 36 questions. The health phenomena are captured in eight scales: physical functioning (PF), role-physical (RP), bodily pain (BP), general health (GH), vitality (VT), social functioning (SF), role-emotional (RE), and mental health (MH). The questionnaire has high validity and reliability (23). The scales are scored so that a higher score indicates better health.

The PBL rehabilitation program

The evaluated program originated in clinical medicine. The leaders of the small groups were specialized in pulmonary medicine, allergology, social medicine, and physiotherapy, and also trained in PBL. When using PBL, the role of the teacher is mainly supportive, to encourage the student to take responsibility for learning optimally from seminars and especially from small-group sessions. The teacher's duty is also to see that the group processes in learning are operating satisfactorily (19, 20). In the present study, the patients worked in small groups and individually.

The first goal for the group part of the health education program was that the patients were to identify factors that trigger their breathing problems within three “themes”:

- 1) “to reflect on cognitive structures”
- 2) “to be subjectively hyperreactive”
- 3) “to be socially limited”.

The second goal was that the patients were to find strategies, practical and mental, to cope with their disorder. They were asked during the group sessions to discuss their asthma-like symptoms from as many aspects as possible and especially in relation to the three “themes”. They started to work with the themes in the group, continued individually, and had a final discussion in the group. Six steps were followed:

- 1) free association (brainstorming) about the theme
- 2) categorization of the associations
- 3) formulation of learning goals for the group and individually
- 4) individual work with the stipulated goals during the time between the group sessions

Table 1. Characteristics of patient groups

Group	Men/women	Age (years) median (range)	Duration of disorder (years) median (range)	FEV ₁ - β_2 %* mean ($\pm$ SD)	FEV ₁ + β_2 %* mean ($\pm$ SD)	PEFR - β_2 %* mean ($\pm$ SD)
I group	3/15	45 (20–63)	9 (2–63)	105 (11)	107 (11)	104 (6)
C group	5/15	30 (21–53)	7 (2–37)	108 (14)	107 (24)	103 (6)
A group SF-36	11/29	43 (21–68)	15 (2–52)	83 (15)	94 (13)	90 (15)
A group NQ	6/34	43 (21–67)	15 (2–53)	82 (14)	95 /12)	90 (14)
H group NQ	5/35	34 (19–59)	–	–	–	–
H group SF-36	4268/4582	Mean 43	–	–	–	–

*Percent predicted normal value before (–) and after (+) inhalation of β_2 -stimulant.

- 5) discussion and evaluation of the work during the next group session
- 6) decision to continue the work with the theme or to choose a new one.

In the individual part of the program, inspired by individual-based cognitive therapy models (18), the patients were asked to write down, using so-called schemes, situations that triggered their asthma-like symptoms and their automatic thoughts in these situations. They were then requested to reflect individually upon whether this was a rational way of thinking and reacting, or whether they could find alternative ways of thinking. The schemes were thereafter discussed during the group sessions. For example, a patient stated that her asthma-like symptoms were triggered by the smell of a workmate's perfume. She thought it very selfish, and felt insulted and nonconfirmed until she discovered that she had not informed her workmate that she could not stand the smell of perfume.

Statistical analysis

Mean values and 95% confidence intervals (95% CI) were calculated. Fisher's permutation test, which includes Fisher's exact test as a special case, was used in the analysis of symptoms for comparison between the groups (28, 29). Pitman's test was used in the analyses of the SF-36.

Results

Symptoms according to the NQ

Prior to the intervention period, there were no significant differences between the I group and the C group regarding their earlier experience of symptoms listed in the NQ. No significant differences were found from the A group of patients with asthma. Both groups scored significantly higher ($P < 0.001$) than the H group of healthy subjects in all components except anxious feelings, where the P value for the I group was $P < 0.05$ and for the C group $P < 0.01$ (Table 2). After the

intervention, the I group scored the frequency of symptoms during the last 2 months significantly lower than before in the components "shortness of breath" ($P < 0.01$), "central tetany" ($P < 0.01$), and "peripheral tetany" ($P < 0.05$). The I group also had a lower score on the frequency of symptoms during the last 2 months than the C group after the intervention for "shortness of breath" ($P < 0.001$) and "central tetany" ($P < 0.05$). In comparison with the A group, the I group scored significantly lower for "shortness of breath" ($P < 0.001$) and the C group significantly lower for "peripheral tetany" ($P < 0.01$). The I group still scored higher than the H group for "shortness of breath" ($P < 0.001$), "central tetany" ($P < 0.01$), and "peripheral tetany" ($P < 0.05$), while the C group scored higher for "shortness of breath" ($P < 0.001$) and "central tetany" ($P < 0.001$) (Table 3). No sex differences were found in the ratings on the NQ.

SF-36

Before the intervention period, there were no significant differences between the I group and the C group except for VT, where the C group scored lower than the I group ($P < 0.05$). The I group scored significantly lower than the A group on PF ($P < 0.05$), BP ($P < 0.01$), VT ($P < 0.05$), and MH ($P < 0.05$). The C group scored significantly lower than the A group on RP ($P < 0.01$), BP ($P < 0.001$), VT ($P < 0.001$), SF ($P < 0.001$), RE ($P < 0.01$), and MH ($P < 0.001$). Both groups scored lower on all scales than the H group (23) (Table 4, Fig. 1). After the intervention, the I group had higher scores on five scales and the C group on four scales, although not significantly higher, but the scores were still lower than those of the two reference groups (Table 5). As for

Table 2. Items of NQ divided into components. Mean ratings (95% CI) and significant differences before intervention between intervention group and control group, group of asthmatics, and group of healthy subjects

Components	I group <i>n</i> = 18	C group <i>n</i> = 20	A group <i>n</i> = 40	H group <i>n</i> = 40
Shortness of breath	1.9 (1.5–2.3)	1.8 (1.5–2.2)	2.02 (1.7–2.3)	0.5 (0.4–0.7)***
Central tetany	1.8 (1.4–2.2)	1.7 (1.3–2.0)	1.6 (1.4–1.9)	0.6 (0.4–0.8)***
Peripheral tetany	1.6 (1.1–2.0)	1.4 (1.0–1.7)	1.6 (1.4–1.9)	0.7 (0.6–0.9)***
Anxious feelings	1.7 (1.2–2.2)	2.0 (1.5–2.5)	2.0 (1.7–2.3)	1.1 (0.8–1.4)*

Mean (95% CI), * $P < 0.05$, ** $P < 0.01$, *** $P < 0.001$.

Table 3. Items of NQ divided into components. Mean ratings (95% CI) and significant differences after intervention between intervention group and control group

Components	I group n=18	C group n=20
Shortness of breath	1.3 (0.9–1.7)	1.7 (1.3–2.1)***
Central tetany	1.2 (0.8–1.5)	1.5 (1.1–1.9)*
Peripheral tetany	1.2 (0.9–1.6)	0.9 (0.5–1.3)
Anxious feelings	1.4 (0.8–2.0)	1.6 (1.1–2.2)

Mean (95% CI), * $P < 0.05$, ** $P < 0.01$, *** $P < 0.001$.

the differences between the scores before and after the intervention, the I group showed a tendency to a higher score for PF ($P = 0.07$). Some sex differences were observed. The men scored significantly higher than the women did on the scales PF ($P = 0.01$), BP ($P = 0.01$), and VT ($P = 0.05$).

Discussion

The results of this exploratory study show that patients with asthma-like symptoms but negative asthma tests experience symptom relief after a problem-based health education program. After termination of the program, the patients of I group reported that they had experienced symptoms listed on the NQ, especially the respiratory and central tetany symptoms, less frequently than the patients of C group. One explanation for the findings might be that the patients had acquired new ways of understanding and handling the asthma-like symptoms. In an earlier study, the patient group reported that the lack of strategies to treat their asthma-like symptoms was a significant problem (3). It is possible that, by finding new strategies, the patients of the present study felt less helpless and thus coped better with their symptoms.

Another explanation might be that the patients of I group acquired a broader view of their own “breathing disorder” by meeting and talking to persons in the same situation. During the group sessions, most patients stated that they had earlier thought that they were alone in having these asthma-like symptoms, and that they

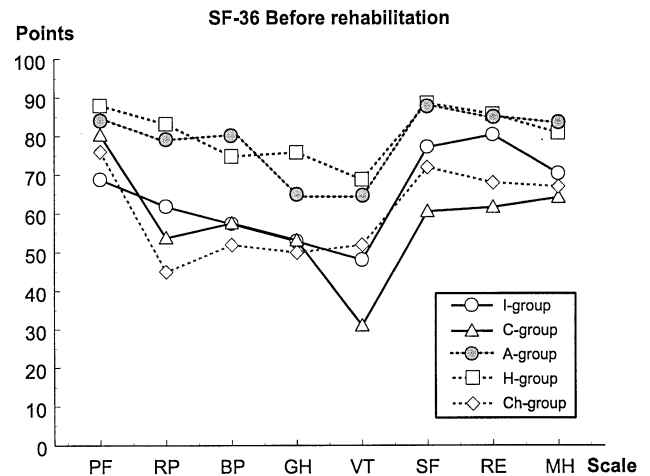


Figure 1. Mean ratings for intervention group, control group, group of asthmatics, group of healthy subjects, and group of subjects with chronic disease on separate scales in SF-36 before rehabilitation.

had felt abnormal, misunderstood, and lonely. By participating in the health education program, the patients of I group were confirmed by their fellow patients and the group leaders. It has been shown in other studies that patients with diffuse symptoms and disorders often feel nonconfirmed by family, friends or health professionals (3, 30, 31). Drew (32) and Cissna & Sieburg (33) have stressed the importance of being seen and confirmed by other subjects. It has also been reported that social support has a moderating role in the adjustment to stressful life events (34).

In the health education program, the patients' health and living conditions were discussed from medical, social, and psychological perspectives. The scores on the SF-36 support the conclusion that it is important to take a comprehensive view of these kinds of patients, looking at their health from different aspects. The SF-36 measures health in eight dimensions: three physically oriented (PF, RP, and BP), one general (GH), and four mentally oriented (VT, SF, RE, and MH). On all the scales, the patients with asthma-like symptoms but negative asthma tests scored lower than the reference

Table 4. Mean ratings (95% CI) on separate scales in SF-36. Significant differences before intervention between intervention group and control group, group of asthmatics, and group of healthy subjects

Scale	I group n=18	C group n=20	A group n=40	H population n=8930
Physical functioning	68.8 (55.4–82.2)	80.3 (70.8–89.7)	84.2 (78.8–89.7)*	89.7 (87.5–88.3)
Role-physical	61.8 (40.9–82.6)	56.6 (40.6–72.6)	78.8 (67.5–90.0)	83.2 (82.5–83.8)
Bodily pain	57.4 (42.7–72.1)	57.6 (46.1–69.0)	79.5 (71.6–87.3)**	74.8 (74.3–75.4)
General health	52.9 (37.4–68.5)	53.2 (45.6–60.8)	64.5 (56.9–72.6)	75.8 (75.4–76.3)
Vitality	46.6 (33.7–59.4)	31.0 (20.5–41.5)*	64.5 (56.8–72.2)*	68.8 (68.3–69.3)
Social functioning	77.2 (63.3–91.1)	60.6 (48.4–72.8)	88.4 (82.4–94.4)	88.6 (88.2–89.0)
Role-emotional	80.4 (61.2–99.6)	61.7 (43.9–79.4)	85.0 (74.0–96.0)	85.7 (85.0–86.3)
Mental health	70.4 (70.4–80.2)	68.6 (57.2–80.1)	83.0 (77.6–88.4)*	80.9 (80.5–81.3)

Mean (95% CI), * $P < 0.05$, ** $P < 0.01$.

Table 5. Mean ratings (95% CI) on separate scales in SF-36. Significant differences after intervention between intervention group and control group

Scale	I group <i>n</i> =18	C group <i>n</i> =20
Physical functioning	75.9 (75.9–84.9)	77.0 (66.3–87.7)
Role-physical	54.2 (32.2–75.2)	60.0 (40.5–79.5)
Bodily pain	64.0 (53.1–74.9)	57.2 (43.4–71.0)
General health	53.2 (38.5–68.0)	58.3 (47.7–68.9)
Vitality	55.6 (41.8–69.3)	42.6 (29.4–56.1)
Social functioning	76.4 (64.5–88.2)	71.3 (57.7–84.8)
Role-emotional	74.1 (54.7–93.4)	61.7 (40.6–82.7)
Mental health	74.2 (66.2–82.2)	68.6 (57.2–80.1)

Mean (95% CI).

groups of patients with asthma and healthy subjects. Patients with asthma-like symptoms but negative asthma tests are often told that they are healthy because the physiological measurements do not show any divergence from normality. Implicitly, this can be interpreted as a hint that they have psychological problems, even though such problems are not mentioned and no support is offered (3). The scores on the SF-36 show that the patients regard themselves as not healthy, either physically or mentally. It is interesting to note that the patients with asthma, despite their high scores for symptoms on the NQ, scored their health higher than the patients with asthma-like symptoms but negative asthma tests. One explanation may be that if one has been given a diagnosis and knows that one is optimally treated, it is easier to cope with symptoms. One sees them in relation to a disease. The patients with asthma-like symptoms but negative asthma tests had not received any diagnosis. Therefore, to reach patients with asthma-like symptoms but negative asthma tests and similar patients, and rehabilitate them successfully, it is important not only to look at their health from a biomedical perspective (35), but also to take into account their total life situation (36).

No significant differences between the scores in the

SF-36 before and after the health education were seen in the intervention group. One explanation for this might be that the instrument is too coarse and not suitable to measure small changes over time. It may also be that the measurements should have been repeated a longer time after the termination of the program. Changes involving psychological processes take time. It is also difficult to demonstrate changes in psychological processes with a quantitative instrument. It can also be difficult to demonstrate the effect of a health education program with a multidisciplinary approach, as there is a lack of instruments to measure such complex changes. There is thus a need to develop new instruments. Another way to elucidate these issues is to use qualitative methods.

In conclusion, rehabilitation by a health education program in which the patients work actively with methods inspired by cognitive behavioral therapy and PBL reduces the frequency of symptoms in patients with asthma-like symptoms but negative asthma tests, and helps them to develop new ways to cope with these symptoms. It is important to keep in mind that there is probably an interaction between many different factors. Therefore, in order to succeed in the rehabilitation of this kind of patient, it is important to have a multidisciplinary and holistic approach.

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