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The effects of a cognitive behavioural intervention in asthmatic patients

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ABSTRACT

The effects of a cognitive behavioural intervention in asthmatic patients. M. Sommaruga, A. Spanevello, G.B. Migliori, M.Neri, S. Callegari, G. Majani.

There is evidence that educational programmes may improve patient's compliance with asthma treatment and control symptoms. Whilst medical parameters have been thoroughly studied, few data are available concerning psychological intervention.

The aim of our open pilot study was to verify whether any difference in perceived illness and response style to asthma existed in the patients enrolled in an Asthma Rehabilitation Group (ARG) and in a Control Group (CG). Forty consecutive asthmatics were randomly enrolled, all of whom were diagnosed, treated and followed-up according to the International Guidelines. Both groups underwent a psychological assessment at baseline and after one year. A battery of questionnaires was used to obtain data relating to baseline characteristics (anxiety, depression, psychophysiological disorders), emotional reactions to asthma attacks (panic-fear, *etc*,) and cognitive variables (external control, psychological stigma, internal beliefs, external chance, *etc*.) involved in the perceived illness. In addition, the Asthma Rehabilitation Group patients underwent an educational programme and a cognitive-behavioural intervention.

In both groups, a reduction of anxiety and depression scores was observed, as well as a significant improvement of the medical parameters evaluated. Only the Asthma Rehabilitation Group reported lower scores on the Psychophysiological Questionnaire and on the External Control Subscale after 1 year. The Control Group reported higher score on the External Chance Scale.

The data of our study seem to confirm the effectiveness of psychological intervention on the cognitive skills involved in the perception and management of asthma. Larger scale studies on this topic are suggested.

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Asthma is a chronic illness in which cognitive behavioural skills assume major importance, both in terms of compliance with the therapeutic regimen and in terms of long-term control of the disease [1]. It is well-known that compliance is generally low when therapeutic regimens are prescribed for chronic diseases, this being also true for the asthmatic condition [2].

Behavioural sciences can, potentially, make a contribution in these areas in two ways: by increasing patients' knowledge of psychological factors which can negatively condition the illness, and by developing strategies which improve the interactive processes between patients, doctors and other team members to decrease morbidity and, in consequence, mortality [3].

The literature is rich in studies [3–9] proposing intervention models aimed at training the patient to: 1) recognize the symptoms of asthma; 2) manage medical treatment, and in particular drug therapy, correctly; 3) recognize symptoms which need urgent action and adopt suitable behaviour; 4) reduce exposure to known triggers; 5) normalize physical and social activities; and 6) communicate effectively with doctors and other personnel.

The data suggest that programmes which make use of cognitive behavioural techniques produce a clearer improvement than programmes in which patients learn passively [3]. The efficacy of these intervention models lies not so much in rendering the patient completely autonomous in the management of his illness - an aim not easily achieved and, in any case, controversial for several reasons - but rather in optimizing the collaboration between doctor, or better still, therapeutic team, and patients in the asthma management.

In the literature, the effectiveness of these intervention programmes is usually assessed with reference to exclusively medical parameters, such as morbidity, mortality, number of asthma attacks, number of admissions to hospital, and so on [4, 7, 10]. Other authors [1, 11], however, suggest that the programmes should emphasize the acquisition of cognitive skills, creating positive attitudes, and improving compliance. Still others [12] have studied the effect of an Asthma School on knowledge about the illness and on the quality of life.

The present study is aimed at evaluating changes in perceived illness and in response style to asthma in the patients enrolled in an Asthma Rehabilitation Programme, including educational programme and psychological intervention.

Methods

Patients

Forty consecutive patients (21 males, 19 females, mean age 48±16 yrs) were enrolled in the study, all asthmatics according to criteria of the American Thoracic Society (1987). All of them were diagnosed, treated and followed up in the same way, according to the International Guidelines [13].

The patients were randomly assigned to an Asthma Rehabilitation Group (ARG; 20 patients; 9

females and 11 males; mean age 44±16 yrs; mean duration of symptoms 10±9 yrs) or a Control Group (CG; 20 patients, 11 females and 9 males; mean age 51±16 yrs; mean duration of symptoms 9±7 yrs).

All the subjects were in-patients admitted at the Medical Centre of Tradate, Respiratory Department, for 9.5±2 (Asthma Rehabilitation Group) and 10±2 (Control Group) days.

Drug schedule

Asthma Rehabilitation Group (ARG). At the time of enrolment, 9 patients used inhaled short-acting beta$_2$-agonists when required (if symptoms occurred); four were prescribed inhaled short-acting beta$_2$-agonists, when required, and theophylline (600 mg·day^{-1}); two used beta$_2$-agonists when required, theophylline (600 mg·day^{-1}) and prednisone (25 mg·day^{-1}); five were prescribed inhaled salbutamol (0.8 mg·day^{-1}), and inhaled beclomethasone dipropionate (200 µg *b.i.d.*) and one of them also used theophylline (600 mg·day^{-1}). Four were prescribed antihistamines in the seasonal period. None used nedocromil sodium.

Control Group (CG). Eleven patients used inhaled short-acting beta$_2$-agonists when required (symptoms); one was prescribed theophylline (300 mg·day^{-1}) and inhaled salbutamol when required; one used prednisone (25–30 mg·day^{-1}), theophylline (600 mg·day^{-1}) and oral salbutamol when required; five were prescribed beclomethasone dipropionate (200–400 µg *b.i.d.*), inhaled salbutamol (three with dosage of 0.8 mg·day^{-1}, two when required); two deflazacort (15 mg·day^{-1}) and salbutamol (0.8 mg·day^{-1}). Three used nedocromil sodium, at irregular intervals, and antihistamines.

Functional evaluation

At enrolment spirometry (Microloop Markos Spirometer, Italy) was performed. Forced expiratory volume in one second (FEV1) was 76±18% of predicted (pred) before and 94±5% pred 20 min after inhaled salbutamol (0.2 mg) in the ARG. In the CG, FEV1 was 81±16% before and 95±4% pred 20 min after inhaled salbutamol.

Intervention

Educational programme. An educational programme was planned for ARG patients. At admission the patients were taught to develop a partnership in asthma management. Physiotherapists gave instructions to the patients on asthma assessment and monitoring by peak flow meter. The patients were given a daily diary (Agendasma, Markos, Italy), where peak expiratory flow (PEF) values (three times a day), drugs used and asthma-related symptoms (dyspnoea, cough, wheezing, number of nocturnal awakenings) were recorded.

ARG patients attended educational meetings managed by the educational staff (physician, physio-therapist and psychologist). Patients attended lessons on asthma (table 1) twice during admission and quarterly in the following year.

All ARG patients were given an emergency phone number, with a physician available 24 h·day^{-1}. At discharge, patients and physician together established a personal medication plan for chronic management (table 2) and acute management (in case of decrease in PEF values), (table 3).

Finally, ARG patients were followed-up six times a year by the same physician (by medical examination, spirometry, PEF evaluation, and educational reinforcement).

Psychological intervention. Cognitive-behavioural intervention was performed on the ARG during three individual meetings between the psychologist and the patient covering the following themes: 1) identification and restructuring of cognitive styles underlying specific behaviours which could compromise

Table 1. – The main topics covered by educational lessons performed for patients enrolled in the Asthma Rehabilitation Group

What is asthma?
How your lungs work
Triggering or provoking factors
Asthma diaries and peak flow monitoring
Aerosol inhalers
Asthma medications
Asthma attack management
Asthma and lifestyle

Table 2. – Therapeutic plan based on FEV1 and symptoms

Baseline FEV1 >80% pred
Symptoms <1 time a week
Inhaled short acting β_2-agonist (taken when needed)
Baseline FEV1 50–80% pred
Symptoms >1 time a week
Daily inhaled corticosteroid
Daily inhaled β_2-agonist
Baseline FEV1 <50% pred
Continuous symptoms
Daily oral corticosteroid and/or daily inhaled corticosteroid
Daily inhaled β_2-agonist

FEV1: forced expiratory volume in one second; % pred: percentage of predicted value.

Table 3. – Example of personal management plan for Asthma Rehabilitation Group patients

Potential normal PEF* 650 L·min^{-1}
Medication plan for chronic management
Clenil forte®, 2 puffs, 3 times daily
Ventolin®, 2 puffs when required
PEF <520 L·min^{-1} (black line in the diary)
Clenil forte®, 2 puffs, 3 times daily
Ventolin®, 2 puffs, 4 times daily
PEF <375 L·min^{-1} (red line in the diary)
Deflan® 1 tablet daily (30 mg)
Clenil forte®, 2 puffs, 3 times daily
Ventolin® 2 puffs, 4 times daily
Contact the doctor

*: Mean of 21 values (three times daily for 1 week) when the patient had no symptoms. PEF: peak expiratory flow. Clenil forte® = beclomethasone dipropionate. Ventolin® = salbutamol. Deflan® = deflazacort.

the outcome of the medical treatment, *i.e.* the constant tendency to overestimate or to underestimate the importance of the respiratory symptoms may lead to over- or underuse of anti-asthma drugs; 2) education on health and awareness both of symptoms and emotional reactions associated with them (it is important, in fact, that the patient learns to discriminate between symptom perception and its emotional consequences, *i.e.* dyspnoea and fear); 3) modification of inappropriate behaviours connected to the illness and the management of symptoms; 4) use of drugs and psychological aspects on anxiety focused on symptoms; and 5) relaxation-training if there were indications present and no contraindications. When progressive relaxation training was needed, it was performed in a short form, requiring only three extra sessions.

The CG did not receive an educational programme or psychological intervention. They were treated according to International Asthma Guidelines and were followed up six times a year by the same physician by means of examination and spirometry [13].

Instruments

Both groups underwent psychometric assessment; a baseline examination was performed within a few days of admission to hospital and a second one was carried out a year after finishing the programme. A battery of questionnaires was used to obtain data relating to baseline characteristics, emotional reactions to asthma attacks and cognitive variables involved in the perceived illness.

More exactly, the following were used: 1) STAI X2 (to assess anxiety trait), QD (to assess depression), QPF (to assess psychophysiological disorders), from the Cognitive Behavioural Assessment 2.0 [14]; 2) Asthma Symptom Checklist in its Italian version (Majani G, Bertolotti G, personal communication, 1987) to assess the emotional reactions to asthmatic crises, *i.e.* panic-fear [15] (see Appendix). 3) Respiratory Illness Opinion Survey in its Italian version (Bertolotti G, Majani G, personal communication, 1987), to assess optimism, negative staff regard, specific internal awareness, external control, psychological stigma, authoritarian attitude [16] (see Appendix); and 4) Health Locus of Control Scale in its Italian version (Bertolotti G, Zotti AM, personal communication, 1987) to assess internal beliefs, external powerful others, external chance [17] (see Appendix).

The assessment was completed with a clinical interview. The same evaluations were repeated one year later.

Statistical analysis

A nonparametric test (Wilcoxon signed rank test) for paired data was used to compare the scores obtained by each group of patients at baseline and at the end of the study, using the Statgraphics Statistical Package (version 7.0 Plus). A p-value of less than 0.05 was considered significant.

Results

At the baseline evaluation, the two groups were homogenous regarding number of asthma attacks, number of hospitalization days, number of emergency visits and number of work/school absences (table 4). No patients from the ARG dropped out of the study, whilst four of the CG dropped out during the follow-up. The baseline evaluation did not reveal significant differences between the groups in cognitive attitude towards the illness. Comparison between baseline and follow-up scores within each group showed the following. There was a significant reduction in the scores of the Cognitive Behavioural Assessment 2.0 scales of anxiety and depression in both groups, but only in the ARG were the scores of the Psychophysiological Questionnaire significantly decreased (table 5). There was a reduction in the scores of the Psychological Stigma subscale of the RIOS in both groups, suggesting a weakening judgement of asthma. Only the ARG showed a decrease in the External Control subscale, which measures to what degree the patient considers his treatment to be exclusively in the hands of others (table 6). There were no significant differences in the scores of HLC in the ARG, whilst there was an increase in the External Chance variable in the CG, which measures the belief that health depends on casual factors and luck (table 7).

Table 4. – Comparison between Asthma Rehabilitation Group and Control Group, concerning four clinical variables (number of asthma attacks; number of hospitalization days; number of emergency visits; number of work/school absences) during the year preceding enrolment

	Asthma Rehabilitation Group	Control Group	p-value
Asthma attacks n	22.1±19.6	20.1±19.9	NS
Hospitalization days n	20.2±6.9	24.3±11.1	NS
Emergency visits n	9.2±9.3	10.4±9.8	NS
Work/school absences n	24.1±11.8	31.8±17.9	NS

NS: nonsignificant

Table 5. – Comparison between baseline follow-up data (raw scores) at enrolment (t_0) and after 1 yr (t_1) (Wilcoxon signed rank Test)

Cognitive Behavioural Assessment	t_0	t_1	p-value
Asthma Rehabilitation Group			
Trait anxiety	43.2(10.0)	36.7(9.1)	<0.0005
Psychophysiological disorder	48.7(9.3)	45.1(9.4)	<0.02
Depressive symptoms	5.8(3.7)	3.6(3.0)	<0.006
Control Group			
Trait anxiety	38.5(9.2)	32.4(5.6)	<0.03
Psychophysiological disorder	42.5(4.3)	41.0(6.6)	NS
Depressive symptoms	4.9(4.3)	2.9(2.9)	<0.05

Data are presented as mean with SD in parenthesis. NS: nonsignificant.

Table 6. – Comparison between baseline and follow-up data (raw scores) at enrolment (t_0) and after 1 yr (t_1) (Wilcoxon signed rank Test)

Respiratory Illness Opinion Survey	t_0	t_1	p-value
Asthma Rehabilitation Group			
Optimism	12.7(3.5)	13.4(4.2)	NS
Negative staff regard	9.8(3.4)	9.6(4.9)	NS
Specific internal awareness	11.7(2.0)	12.3(2.4)	NS
External control	10.1(3.8)	8.4(3.5)	<0.05
Psychological stigma	9.0(3.8)	7.5(3.8)	<0.03
Authoritarian attitudes	15.8(5.5)	15.3(4.9)	NS
Control Group			
Optimism	14.1(4.1)	14.3(4.3)	NS
Negative staff regard	8.6(3.6)	9.2(2.9)	NS
Specific internal awareness	12.6(2.0)	13.3(2.6)	NS
External control	12.3(5.1)	11.5(4.0)	NS
Psychological stigma	10.2(5.6)	7.8(3.8)	<0.03
Authoritarian attitudes	17.5(5.7)	17.9(5.7)	NS

Data are presented as mean with SD in parenthesis. NS: non-significant.

Table 7. – Comparison between baseline and follow-up data (raw scores) at enrolment (t_0) and after 1 yr (t_1) (Wilcoxon signed rank Test)

Health Locus of Control Scales	t_0	t_1	p-value
Asthma Rehabilitation Group			
Internal beliefs	15.6(2.6)	17.1(3.4)	NS
External-powerful-others	1.7(1.8)	1.9(1.8)	NS
External chance	9.4(2.9)	8.9(3.3)	NS
Total	25.1(3.3)	26.0(4.6)	NS
Control Group			
Internal beliefs	16.0(3.1)	14.6(2.7)	NS
External-powerful-others	2.1(2.0)	2.2(2.1)	NS
External chance	9.9(3.5)	11.5(3.0)	<0.03
Total	25.9(3.4)	26.1(2.9)	NS

Data are presented as mean with SD in parenthesis. NS: non-significant.

The ASC scores were not considered because seven patients from the AR had no further asthmatic crises in the period following the enrolment, thus making the compilation of the test at follow-up, and statistical comparison, impossible.

In both groups (ARG and CG) a significant difference was found comparing four clinical variables (number of attacks; number of hospitalization days; number of emergency visits; and number of work/school absences) in the year preceding *versus* the year following enrolment ($p<0.05$).

Comparing ARG and CG for each one of the variables in the year following enrolment a difference was found for the number of asthma attacks ($p<0.05$).

Discussion

The aim of our study was to verify whether there was any difference in perceived illness and in response style to asthma in ARG and in CG. The results of our study show that these differences exist.

A first, positive, recognizable result is the absence of drop out from within the ARG, which may be an indirect measure of how much the patient appreciated the type of intervention and felt actively involved in the therapeutic programme. Normally, the programme was accepted without reserve by patients, although some of them entertained some doubt regarding the daily compilation of the diary (Agendasma) and daily recording of peak flow rate. However, the necessity of these registrations was well perceived and accepted. Concerning the benefit of the Programme, the ARG patients quite often expressed verbally an improvement of the capacity in perception regarding their own breathing pattern and about rationale in understanding drugs therapy.

The decrease in anxiety and depression scores seen in the Cognitive Behavioural Assessment scales in both groups (table 5) can be interpreted as the result of the rehabilitation approach *per se*, independent from the offer of cognitive-behavioural intervention. In contrast, the lower scores in the Psychophysiological Questionnaire in the ARG seem to be connected to a selective and prudent use of relaxation training, which was prescribed in the presence of specific indications and led to a lower psychophysiological arousal in patients in which this was particularly intense.

The reduction in the score of the External Control subscale of the Respiratory Illness Opinion Survey (RIOS) (table 6) in the ARG confirms the decrease, which took place, in the tendency to delegate management of the illness. This can be indirectly confirmed by the increase, in the CG, in the tendency to attribute a major role in the control of health to fate (External Chance score of the Health Locus of Control Scales (HLC) (table 7)).

A limit of our pilot study is represented by the small sample size, that cannot protect the study from a type II error in case of negative results. Another problem is the wide age range of patients enrolled, with a significant difference between ARG and CG.

The observation that both ARG and CG had a dramatic fall in the four clinical variables after enrolment seems to indicate that medical treatment, prescribed according to the International Guidelines [13], is the first priority to be achieved by rehabilitation programmes. The additional benefit given by the ARG is represented by a significant reduction in asthmatic crises. In our study, the use of Agendasma and peak flow meter, as described by others [18], appears to be relevant in helping to prevent asthmatic attacks. Patients' acceptability of the proposed programme was satisfactory in ARG and CG.

In conclusion, the data of our study seem to confirm the effectiveness of psychological intervention on the cognitive skills involved in the perception and management of illness. Certainly, the results obtained need further verification in a larger sample group with a smaller age spread, and without sex or age related biases. However, we consider it a positive step to have refocused attention on the measure to which cognitive variables are open to modification in order to optimize the patient's overall response, not merely to asthma crises but especially to asthma as a chronic illness.

Appendix

Asthma Symptom Checklist (ASC)

Symptom category	Symptom category description
1) Panic-fear (P-F)	Panic and anxiety focused upon asthma attacks
2) Irritability (I)	Feelings of irritation
3) Fatigue (F)	Reduced energy level and fatigue
4) Hyperventilation-hypocapnia (H-H)	Hyperventilation symptoms
5) Airways obstruction/dyspnoea (AO/D)	Breathing difficulty symptoms
6) Airways obstruction/congestion (AO/C)	Chest congestion symptoms
7) Worry (W)	Worry and concern about self
8) Anger (A)	Feelings of anger
9) Loneliness (L)	Feelings of loneliness and isolation
10) Rapid breathing (RB)	Symptoms of rapid breathing, pounding and panting

Respiratory Opinion Survey (RIOS)

Attitude category	Attitude category description
1) Optimism (O)	Professed ability to cope with and master the asthma
2) Negative staff regard (NSR)	Dissatisfaction about treatment and towards medical caregivers
3) Specific internal awareness (SIA)	Degree to which the patient reports being aware of the early bodily signals of an asthma attack
4) External control (EC)	Extent to which the patient regards treatment as being exclusively in the hands of others
5) Psychological stigma (PS)	Extent to which asthma is regarded as psychological flaw

Health Locus of Control Scale (HLC)

The HLC measures three separate categories of the concept of control as related to health

1. Internal beliefs: this refers to the internal orientation of control according to which many aspects of an individual's own health can be controlled by that same individual's behaviour.
2. External powerful others: refers to an orientation according to which the power over an individual's health is in the hands of doctors and regular contact with them and strict adherence to their prescriptions is the best way to stay healthy.
3. External chance: refers to the belief that health depends on chance and casual factors.

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