Long-term repercussions of a pulmonary rehabilitation program on the indices of anxiety, depression, quality of life and physical performance in patients with COPD*

Repercussões tardias de um programa de reabilitação pulmonar sobre os índices de ansiedade, depressão, qualidade de vida e desempenho físico em portadores de DPOC

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Abstract

Objective: To assess the 24-month effects of a pulmonary rehabilitation program (PRP) on anxiety, depression, quality of life and physical performance of COPD patients. **Methods:** Thirty patients with COPD (mean age, 60.8 ± 10 years; 70% males) participated in a 12-week PRP, which included 24 physical exercise sessions, 24 respiratory rehabilitation sessions, 12 psychotherapy sessions and 3 educational sessions. All patients were evaluated at baseline (pre-PRP), at the end of the treatment (post-PRP) and two years later (current) by means of four instruments: the Beck Anxiety Inventory; the Beck Depression Inventory; Saint George's Respiratory Questionnaire; and the six-minute walk test (6MWT). **Results:** The comparison between the pre-PRP and post-PRP values revealed a significant decrease in the levels of anxiety (pre-PRP: 10.7 ± 6.3; post-PRP: 5.5 ± 4.4; p = 0.0005) and depression (pre-PRP: 11.7 ± 6.8; post-PRP: 6.0 ± 5.8; p = 0.001), as well as significant improvements in the distance covered on the 6MWT (pre-PRP: 428.6 ± 75.0 m; post-PRP: 474.9 ± 86.3 m; p = 0.03) and the quality of life index (pre-PRP: 51.0 ± 15.9; post-PRP: 34.7 ± 15.1; p = 0.0001). There were no statistically significant differences between the post-PRP and current evaluation values. **Conclusions:** The benefits provided by the PRP in terms of the indices of anxiety, depression and quality of life, as well as the improved 6MWT performance, persisted throughout the 24-month study period.

Keywords: Pulmonary disease, chronic obstructive; Rehabilitation; Exercise; Quality of life; Anxiety; Depression.

Resumo

Objetivo: Analisar os efeitos, após 24 meses, de um programa de reabilitação pulmonar (PRP) sobre os níveis de ansiedade, depressão, qualidade de vida e desempenho físico em pacientes com DPOC. **Métodos:** Trinta pacientes com DPOC (idade média, 60,8 ± 10 anos; 70% do sexo masculino) participaram de um PRP com 12 semanas de duração, incluindo 24 sessões de exercício físico, 24 sessões de reeducação respiratória, 12 sessões de psicoterapia e 3 sessões educacionais. Os pacientes foram avaliados na linha de base (pré-PRP), ao término do PRP (pós-PRP) e dois anos mais tarde (momento atual) através de quatro instrumentos: Inventário de Ansiedade de Beck; Inventário de Depressão de Beck; Questionário Respiratório do Hospital Saint George; e teste da caminhada de 6 minutos (TC6). **Resultados:** A comparação entre o pré-PRP e o pós-PRP revelou uma redução significativa dos níveis de ansiedade (pré-PRP: 10,7 ± 6,3; pós-PRP: 5,5 ± 4,4; p = 0,0005) e de depressão (pré-PRP: 11,7 ± 6,8; pós-PRP: 6,0 ± 5,8; p = 0,001), assim como melhoras na distância percorrida no TC6 (pré-PRP: 428,6 ± 75,0 m; pós-PRP: 474,9 ± 86,3 m; p = 0,03) e no índice de qualidade de vida (pré-PRP: 51,0 ± 15,9; pós-PRP: 34,7 ± 15,1; p = 0,0001). Não houve diferenças estatisticamente significativas entre os resultados do pós-PRP e os do momento atual. **Conclusões:** Os benefícios obtidos através do PRP sobre os índices de ansiedade, depressão e qualidade de vida, assim como no TC6, persistiram ao longo dos 24 meses.

Descritores: Doença pulmonar obstrutiva crônica; Reabilitação; Exercício; Qualidade de vida; Ansiedade; Depressão.

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Introduction

Chronic obstructive pulmonary disease is extremely incapacitating and can affect various aspects of the life of patients. The number of patients who suffer from this disease has gradually increased in recent years. Consequently, there has been a significant increase in the number of hospitalizations and in expenditures by the public social security system.[1]

In patients with COPD, the rates of anxiety and depression range from 21% to 96% and from 27% to 79%, respectively,[2] which further impairs the quality of life of such patients. With the progression of the disease, the effects of COPD become permanent. The progressive increase in dyspnea causes patients to alter their lifestyle, since they feel unable to maintain it as it was before the first manifestations of the disease.[3]

The impact of COPD on the individual is not restricted to the physical limitation. In addition to the physical difficulties observed during the performance of activities of daily living, disease-related limitations are also perceived in affective, conjugal and sexual interactions, as well as in leisure and professional activities. Therefore, many patients become highly dependent on their family members, and this reinforces their sense of being incapacitated.[4]

The immediate effects of pulmonary rehabilitation are well documented in the literature.[5] However, there have been few studies on the long-term duration of such effects, especially regarding emotional variables.

The objective of the present study was to determine whether the beneficial effects that a pulmonary rehabilitation program (PRP) has on anxiety, depression and quality of life persist 24 months after the end of treatment in patients with COPD.

Methods

The present study was carried out at the *Instituto de Medicina do Esporte e Ciências Aplicadas ao Movimento Humano da Universidade de Caxias do Sul* (IME-UCS, Institute of Sports Medicine and Applied Human Movement Sciences of the University of Caxias do Sul), which is a referral center for pulmonary rehabilitation in the northeastern region of the state of Rio Grande do Sul.

The sample consisted of 30 patients with COPD who had participated in PRPs at the IME-UCS two years prior and were not currently being monitored by the rehabilitation team. The patients were staged as having severe and extremely severe COPD, in accordance with the criteria of the Global Initiative for Chronic Obstructive Lung Disease (GOLD).[6] All patients used long-acting inhaled β_2 agonists and inhaled corticosteroids regularly, as well as short-acting β_2 agonists and inhaled ipratropium bromide when necessary. Only 3 patients were using antidepressants before enrolling in the PRP, and 2 were still using this medication at the time of the current evaluation.

The measurement instruments, described below, were administered by the same psychologist at three time points: prior to treatment initiation (pre-PRP), at the end of the treatment (post-PRP) and 24 months after the end of the treatment (current).

- The Beck Anxiety Inventory (BAI) evaluates common anxiety symptoms based on a list of 21 symptoms with 4 alternatives each. The alternatives are listed in ascending order by level of anxiety. This instrument has been validated for use in Brazil[7] with the following classification: 0-10 points, minimum; 11-19 points, mild; 20-30 points, moderate; and 31-63 points, severe. Anxiety is considered clinically significant when present (classified as mild or greater).

Table 1- Comparison of the indices of anxiety, depression, quality of life and exercise capacity obtained in the pre-PRP evaluation and those obtained in the post-PRP evaluation.

Parameter	Pre-PRP evaluation	Post-PRP evaluation	p
BAI score	10.7 ± 6.3	5.5 ± 4.4	0.0005
BDI score	11.7 ± 6.8	6.0 ± 5.8	0.001
SGRQ score (%)			
Symptoms	56.8 ± 21.7	51 ± 24	0.336
Activity	61.5 ± 22.2	42 ± 20	0.001
Impact	37.1 ± 19.3	23.6 ± 14.7	0.006
Total	51 ± 15.9	34.7 ± 15.1	0.0001
6MWD, m	429 ± 75	474.9 ± 86.3	0.03

PRP: pulmonary rehabilitation program; BAI: Beck Anxiety Inventory; BDI: Beck Depression Inventory; SGRQ: Saint George's Respiratory Questionnaire; 6MWD: six-minute walk distance. Data presented as mean ± SD.

- The Beck Depression Inventory (BDI) comprises 21 categories of symptoms and activities, with 4 alternatives each. The alternatives are listed in ascending order by level of depression. The patient must choose the alternative that seems to be the most appropriate. The sum of the scores identifies the level of depression. This instrument has been validated for use in Brazil[7] with the following classification: 0-11 points, minimum; 12-19 points, mild; 20-35 points, moderate; and 36-63 points, severe. Depression is considered clinically significant when present (classified as mild or greater).
- The Saint George's Respiratory Questionnaire (SGRQ) was used to determine the quality of life index. This instrument measures the degree to which COPD impinges upon the life of patients, evaluating three domains: symptoms; limitations in activities of daily living; and impact of the disease on the individual. Each domain has a maximum possible score, and values greater than 10% reflect altered quality of life in that domain. Alterations equal to or greater than 4% after an intervention indicate a significant change in the quality of life of patients. This questionnaire has been translated and validated for use in Brazil.[8]
- The six-minute walk test (6MWT)[9] was used to evaluate the walking competency of patients with COPD.

The study protocol was submitted to the ethics in research committee of the institution, and all participating patients gave written informed consent.

All study participants were enrolled in a PRP consisting of the following activities:

a) Two weekly sessions of physical exercise, including upper limb, lower limb and flexibility exercises, as well as aerobic exercises on a treadmill. The intensity of the exercise was graded based on patient signs and symptoms.[10] This activity was supervised by the physical education professional and lasted for 60 min.
b) One weekly session of group psychotherapy, conducted by the psychologist. The psychotherapy sessions addressed patient psychological needs, including difficulties in social life, in marital life and at work, as well as health problems. To that end, cognitive therapy techniques,[11] to aid in the management of anxiety, and logotherapy techniques were used.[12]
c) One monthly group educational session, conducted by the pulmonologist, to discuss important topics regarding COPD. The objective of the educational sessions was to enable patients to incorporate into their daily routine important aspects that might improve their quality of life.[13,14]
d) Two weekly meetings with the physical therapist in order to work on respiratory rehabilitation. During the physical therapy sessions, the patients were taught techniques for diaphragmatic and pursed-lip breathing, as well as how to use scalene and sternomastoid muscles more effectively and to remove excess respiratory secretions.[15]

At the end of the 12-week period, the patients had attended a total of 24 physical exercise sessions, 24 respiratory rehabilitation sessions, 12 psychotherapy sessions and 3 educational sessions. After completing the 12-week treatment, all of the patients went through the same phases as those of the initial evaluation, being evaluated by the same professionals, using the same methodology (post-PRP evaluation).

Two years after participating in the PRP, having had no contact with the rehabilitation team since the end of the treatment, the patients were reevaluated using the same instruments (current evaluation).

Table 2 - Comparison of the indices of anxiety, depression, quality of life and exercise capacity obtained in the post-PRP evaluation and those obtained in the current evaluation.

Parameter	Post-PRP evaluation	Current evaluation	P
BAI score	5.5 ± 4.4	7.3 ± 4.8	0.127
BDI score	6.0 ± 5.8	7.8 ± 5.7	0.228
SGRQ score (%)			
Symptoms	51 ± 24	47.3 ± 15.4	0.496
Activity	42.1 ± 20.0	50.3 ± 19.4	0.121
Impact	23.6 ± 14.7	31.7 ± 13.7	0.05
Total	34.7 ± 15.1	40.0 ± 13.3	0.157
6MWD, m	474.9 ± 86.3	451.0 ± 74.2	0.254

PRP: pulmonary rehabilitation program; BAI: Beck Anxiety Inventory; BDI: Beck Depression Inventory; SGRQ: Saint George's Respiratory Questionnaire; 6MWD: six-minute walk distance. Data presented as mean ± SD.

Statistical analysis

Quantitative data are expressed as mean and SD, and categorical variables are expressed as percentage. Comparisons among the pre-PRP, post-PRP and current values were made using the Student's t-test or the chi-square test, depending on the type of variable assessed. The level of significance was set at 0.05. Data were processed and analyzed using the program Statistical Package for the Social Sciences for Windows, version 6.0 (SPSS Inc., Chicago, IL, USA) and the Epi Info 2002 program.

Results

From August to September of 2006, 42 patients who had completed PRPs at the IME-UCS by August of 2004 were contacted for a reevaluation of the following parameters: anxiety, depression, quality of life and six-minute walk distance (6MWD). Of those patients, 3 declined to participate, 6 had died, and 3 were experiencing a clinical exacerbation. Therefore, the sample comprised 30 patients. Patients were reevaluated in September and October of 2006.

There was a predominance of males (21 individuals, 70%) and Caucasians (27 individuals, 90%). The mean age was 60.8 ± 10 years. Of the 30 participants, 25 (83.3%) were married, 17 (56.6%) had completed elementary school, and 24 (80%) were retired. The mean FEV_1 presented by the patients was 31.9 ± 9.4%. All patients were staged, in accordance with the GOLD criteria, as having severe or extremely severe COPD.

The pre-PRP and post-PRP BAI, BDI and SGRQ scores, as well the pre-PRP and post-PRP 6MWD, are shown in Table 1.

The pre-PRP evaluation revealed that 14 individuals (46.6%) had clinically significant anxiety and 15 (50%) had depression. The SGRQ scores indicated that quality of life was seriously affected in all three domains: symptoms; limitations in activities of daily living; and impact of the disease. The patients walked, on average, 428 m on the 6MWT (Table 1).

In the post-PRP evaluation, carried out immediately after the end of the treatment, the study subjects demonstrated statistically significant reductions in the levels of anxiety and depression. There was a statistically significant improvement in quality of life, and all of the SGRQ domain scores were at least 4% lower. At the end of the treatment, there was an increase in the 6MWD.

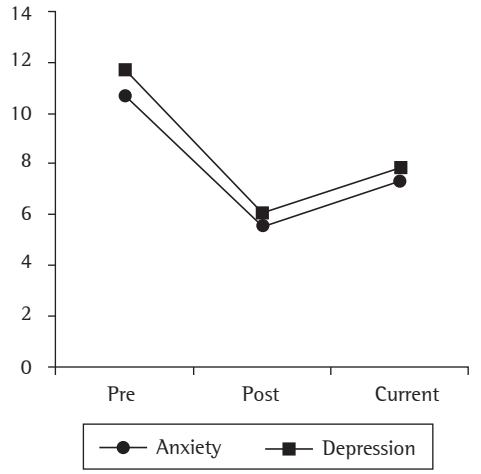

Figure 1 - Comparison of the values (means) obtained for anxiety and depression at the three time points analyzed. Pre = prior to treatment initiation; Post = at the end of the treatment; and Current = 24 months after the end of the treatment.

The patients had no contact with the rehabilitation team after the final PRP session and were reevaluated at least 24 months after the end of the treatment (current evaluation). The

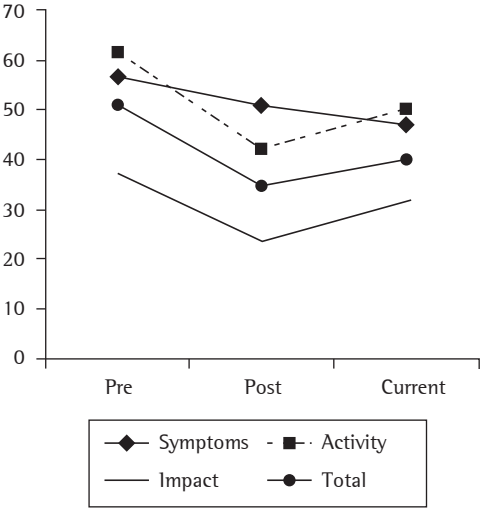

Figure 2 - Comparison of the values (means) obtained using Saint George's Respiratory Questionnaire (domain scores and total score) at the three time points analyzed. Pre = prior to treatment initiation; Post = at the end of the treatment; and Current = 24 months after the end of the treatment.

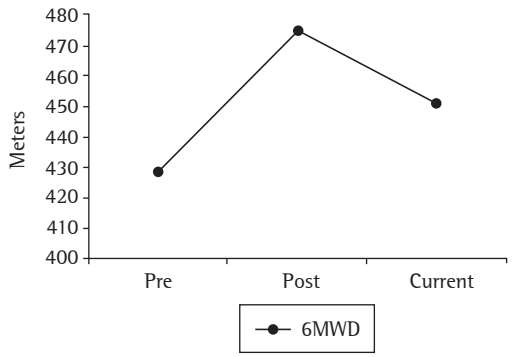

Figure 3 - Comparison of the mean six-minute walk distance (6MWD, m) obtained at the three time points analyzed. Pre = prior to treatment initiation; Post = at the end of the treatment; and Current = 24 months after the end of the treatment.

comparison of the post-PRP and current evaluation values revealed no statistically significant differences. The levels of anxiety (p = 0.127), depression (p = 0.228), quality of life (p = 0.157) and 6MWD (p = 0.254) remained stable. In the SGRQ impact domain, the difference was borderline (p = 0.05).

Table 2 presents the comparison between the post-PRP evaluation and current evaluation values in terms of the results regarding the BAI, BDI and SGRQ scores, as well as the 6MWD.

The comparison of the results obtained in the current evaluation and those obtained in the pre-PRP evaluation revealed that, for all variables studied, the former were significantly better (Figures 1, 2 and 3): BAI score (p = 0.013); BDI score (p = 0.009); SGRQ symptoms domain score (p = 0,017); SGRQ activity domain score (p = 0,001); SGRQ impact domain score (p = 0,029); SGRQ total score (p = 0,001); and 6MWD (p = 0.018). Regarding the SGRQ symptoms domain, the patients presented better results in the long-term evaluation than at the time they were participating in the PRP.

Discussion

The present study demonstrated, by means of a long-term analysis of a sample of 30 patients with COPD (carried out two years after those patients participated in a PRP), that the short-term benefits obtained, that is, the reduction in the levels of anxiety and depression, the improvement in quality of life and the increase in the 6MWD, persisted in the long run.

The sample consisted primarily of male Caucasian smokers who were married, had completed elementary school, had severe or extremely severe COPD, were approximately 60 years of age and did not work. Those same characteristics have been found in patients included in other studies.[16,17]

Anxiety and depression are common in patients with COPD. In the pre-PRP evaluation, 46.6% of the patients in the present sample had anxiety and 50% had clinically significant depression. In the post-PRP evaluation, those indices decreased to 16.6% for anxiety and depression alike. Variations in the levels of anxiety in patients with COPD have been reported in 21% to 96% of the cases.[18,19] Half of our patients had depression. Other authors have found rates between 27% and 79%.[20,21] It has been emphasized that, although depression as a psychological symptom does not achieve statistical significance in some cases, it is possible that depression is being underdiagnosed and undertreated in the population of patients with COPD.[20]

Among the patients included in the present study, there was no statistically significant difference between pre-PRP and post-PRP values for SGRQ symptoms domain scores. It is worthy of note that, in the application of this instrument, the symptoms domain evaluates that changes seen in the previous year. The post-PRP SGRQ was administered three months after the study outset, in accordance with the protocol. When again questioned about the item regarding symptoms, the patients responded taking into consideration the previous year, this period including the months prior to rehabilitation. This might explain the fact that we found no differences between the pre-PRP and post-PRP evaluations in terms of the symptoms domain. The comparison of the pre-PRP and current evaluations revealed that the SGRQ domain scores were lower in the latter than in the former.

The results obtained in the comparison of the pre-PRP and post-PRP evaluations are corroborated by various short-term studies, which demonstrated a reduction in the levels of anxiety and depression,[22] improvement in the indices of quality of life[23] and improvement in exercise capacity.[24] The short-term benefits

decrease over time if the physical training is discontinued, similarly to what occurs in healthy individuals.[25]

Few studies have evaluated the long-term effects of PRPs, especially in terms of emotional variables. One investigation[26] monitored, for two years, patients who completed a PRP. Those patients were randomized into two groups: an experimental group, monitored through weekly phone calls and monthly sessions similar to those offered during the rehabilitation period; and a control group, receiving standard treatment and instructions to perform the exercises at home. At the end of the study, there were no significant differences between the groups, although, in both, there was a gradual loss of the benefits obtained, especially regarding exercise capacity, quality of life and depression. However, these indices remained higher than the baseline indices. Similar results were found in a study with the same follow-up period.[27] In another study with an 18-month follow-up period,[28] one group was monitored through weekly sessions conducted by a physical therapist, another group attended monthly sessions and a third group attended no sessions at all. Although, at the end of the treatment, the two first groups demonstrated a statistically significant difference in physical performance and quality of life, only the group monitored monthly managed to maintain the improvement in quality of life for 18 months. None of the groups maintained the improvement in exercise tolerance. A study with a post-PRP one-year follow-up period found significant improvements in quality of life and exercise tolerance, as well as a reduction in the length of hospital stays, but no impact on anxiety or depression variables,[29] differing from the findings of the present investigation.

In one study,[30] the effects of pulmonary rehabilitation were evaluated using two groups. One group, after completing the treatment, received home maintenance, and the other remained without maintenance. The results obtained after 21 months demonstrated that there were no significant differences between the groups in terms of the walk test or in terms of quality of life, the results remaining above the baseline indices, despite the progressive losses. The design of the present study is similar to the design of that study. At the end of the treatment at the IME-UCS, no program maintenance was proposed. Although the rehabilitation team instructed the patients to perform activities at home, the patients were not contacted or supervised by the team after the end of the treatment. Nevertheless, residual effects of the treatment could be seen in the patients. It is possible that the type of PRP established is more important than is the maintenance proposal.

One aspect that could explain the long-term maintenance of the improvement in the indices of anxiety and depression is the fact that our team conducted weekly psychotherapy sessions after having confirmed the efficacy of such sessions in a previous study.[2] In that study, patients were randomized into three groups: Group 1, complete PRP (education, exercise, physical therapy and psychotherapy); Group 2, partial PRP (physical therapy, education and psychotherapy); and Group 3, partial PRP (physical therapy, education and exercise, without psychotherapy sessions). At the end of the treatment, the patients in all three groups presented statistically significant reductions in the level of anxiety. However, the patients in Group 3 presented significantly less reduction in the behavioral symptoms of anxiety and depression. There was also significantly less improvement in quality of life in Group 3. In that group, none of the SGRQ domain scores presented a mean reduction greater than 4% at the end of the treatment. Regarding the 6MWD, the groups behaved similarly, and all presented a statistically significant improvement. The differential in the rehabilitation group that participated in the IME-UCS PRP is the inclusion of psychotherapy sessions. Few of the studies published have employed weekly psychotherapy as a tool of rehabilitation. Our studies confirmed that there is a significantly greater improvement in the psychosocial parameters in patients who participate in a complete PRP.

We believe that the maintenance of the effects was possible due to learning and due to the specific changes in the patient activities of daily living. When asked about what they did during the period away from the PRP, most patients stated that the fear of feeling ill and having the same problems presented prior to rehabilitation was the determining factor for remaining active and practicing the techniques learned during the PRP.

Certainly, living with a chronic disease is not an easy task, requiring patience and knowledge. If patients are able to know how their mind and their body work, the possibility of maintaining the disease under control is greatly increased.

We conclude that the benefits provided by the PRP in terms of the indices of anxiety, depression, quality of life and performance on the 6MWT persisted in the long run. Further studies, with longer follow-up periods, are necessary in order to determine the duration of these beneficial effects, especially the effects on the indices of anxiety, depression and quality of life.

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