Original Research

Persons With Chronic Obstructive Pulmonary Disease and High Levels of Activation Improved Their Physical Activity Skills After an Educational Session

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Running Head: **Activation in COPD and Education Session**

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***Abbreviations*: COPD**=chronic obstructive pulmonary disease; **PAM**=patient activation measure; **PA**=physical activity; **BMI**=body mass index; **Me IR**=median and interquartile range; n number of patients; **%**=percentage of patients; **MSE**=mean standard error; **ρ**=Spearman's Rho coefficient; **Actv**=Activity.

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ABSTRACT

Background: Daily physical activity is part of the self-management of COPD patients, didactic information sessions may be insufficient for provision of these skills. Prior activation can determine sensitivity to these sessions.

We evaluated whether the activation in patients with chronic obstructive pulmonary disease (COPD), as measured by the Patient Activation Measure (PAM)-13 questionnaire, determined their responses to an educational group session on physical activity (PA), which were measured with actigraphy by the amount of steps/day.

Methods

We conducted an uncontrolled clinical trial in outpatient clinic with 75 patients with non-exacerbating COPD (FEV1 30-80%) who were selected consecutively. Patients were provided with an actigraph that they used for 15 days and completed the PAM-13 questionnaire. On the eighth day, they attended a group educational session where they were given PA information. We compared the changes in activity after the session by pooled MAP levels and the correlation between the change in the number of steps/day and the PAM-13 questionnaire.

Results: 26 patients had activation levels of 1-2, while 49 patients had levels of 3-4. After the session, patients in levels 1-2 decreased their number of steps (-596±42), while those in levels 3-4 increased them (680±253, $p<0.01$). The level of activation was positively correlated with change in the number of steps/day ($p<0.05$).

Conclusion: COPD patients with greater activation showed greater improvements in daily PA after a group educational session.

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INTRODUCTION

Daily physical activity (PA) has benefits for chronic obstructive pulmonary disease (COPD) and is considered part of a patient's self-management routine. However, conducting self-management, requires patient education with adequate information and advice. Although it is assumed that improving patient knowledge is an important part of self-management[1], it has been proven[2,3] and also assumed by experts[4], that group didactic sessions are insufficient for promoting self-care skills. A critical aspect of self-care is activating patients with the skills, knowledge, and motivation needed to participate as members of the team that develops their care[5]. Today, several tools, such as the Patient Activation Measure (PAM)-13 questionnaire, can be used to measure patient activation that are valid, reliable, and offer good psychometric properties that can be used individually[6]. The PAM-13 scale measures the level of patients' engagement in their healthcare. The patient's activation ranges from believing that their role is important to keeping their healthy behaviour under stress. These tools are very useful, because activation can condition the results of a patient intervention. Simple, self-administered care interventions can be cost-effective and, when combined with monitoring technologies, can produce changes in patients' self-management in the short term by measuring daily PA in real-time using a smart device with haptic feedback via actigraphy[7]. However, these same studies have highlighted the weak recruitment of patients to PA programs, probably due to their inadequate activation levels. Therefore, we investigated whether the activation of COPD patients, as assessed by the PAM-13 questionnaire, determines their responses, quantified in steps/day by actigraphy, to a group educational activity based on simple interventions in their daily activities[8].

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METHODS

Study Design

A nonrandomized quasi-experimental study, with pre-test post-test for one group was conducted at the pneumology service of a hospital. Patient recruitment took place during the months of January, February, March and October 2019.

Study Population

The study participants had to meet the following criteria: age of 50-80 years, diagnosed with COPD with FEV_1 between 30% and 80% of the predicted value according to the SEPAR (Spanish Society of Pneumology and Thoracic Surgery) reference values, BODEx (the body-mass index (B), the degree of airflow obstruction (O), functional dyspnea (D), exercise capacity (E) and severe exacerbations (X)) index of less than 5 points, non-exacerbators (defined as no or one exacerbation per year that did not lead to the hospital admission), owned a mobile phone with the WhatsApp® application, and agreed to participate in the study by signing an informed consent form. The BODEx index was calculated using the score proposed by Celli et al.[9]: body mass index (BMI), dyspnea was assessed using the modified Medical Research Council scale, FEV_1 and three categories generated by exacerbations (0, 1, or 2 points), replacing the walking test (the absence of severe exacerbation was scored as 0, the presence of 1–2 severe episodes received 1 point, and ≥3 severe exacerbations were scored as 2). Therefore, the score range for this index is between 0 and 9 points[10]. The occurrence of an exacerbation during the monitoring time would condition the results of the study

Patients were excluded if they declined to participate in the study, were unable to perform any of the tests, did not speak language of the country, did not know how to read, or had any of the

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following: COPD exacerbating phenotype, an uncontrolled heart disease, uncontrolled pulmonary hypertension, an exacerbation in the previous four weeks, severe psychiatric illness, cognitive impairment, or concomitance with another severe pulmonary pathology (e.g., severe sleep apnea syndrome, diffuse interstitial lung disease, bronchiectasis). A consecutive non-probabilistic sampling was carried out in which; patients who attended the pneumology service and met all the inclusion criteria (and none of the exclusion criteria) were selected sequentially until the proposed sample size was achieved. All study subjects received oral and written information about the objectives of the study and the procedures that would be performed. To start the study, a signed informed consent form was required from each participant. This study was previously approved by the Clinical Research Ethics Committee of the Clinical Hospital.

Data collection

First, each patient underwent a clinical interview during which their clinical data were collected (sex, age, anthropometric data, degree of dyspnea on the mMRC scale, number of exacerbations in the previous year, current smoking habits and accumulated consumption). Next, we reviewed their electronic medical records to obtain the necessary data on the clinical phenotype of their COPD and their main comorbidities, which were necessary for the calculation of the BODEx, CCI (Charlson Comorbidity Index), and COTE (Comprehensive Occupational Therapy Evaluation Scale) clinical indices. We also obtained the most recent post-bronchodilator spirometry.

Procedure

The patients were provided with the CAT (Copd Assessment Test), HADS (Hospital Anxiety and Depression Scale), IPAQ (International Physical Activity Questionnaire), and PAM-13

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questionnaires, as well as a GT3x® accelerometer with a wrist bracelet for use over the next 15 days. They were then given an appointment for a 45-minute educational group session of 6-8 patients on day 8, during which they were educated on nutrition and inhaler use and were provided with PA information related to the 'on your feet to earn your seat' principles[11] (Online data supplement 1). At the end of the session, the participants were provided with complete information in writing, (Online data supplement 2). They were instructed to continue using the accelerometer for the next seven days. Motivational reinforcement was carried out on days 2 and 6 at 9 am and on day 4 at 9 pm (Online supplement 3).

Outcomes

The primary outcome was the change of steps/day before and after the intervention, which was extracted from the GT3x accelerometer according to the level of activation by the PAM-13 questionnaire. PAM-13 consists of 13 items on a Likert scale. Each item has five response categories with scores from 1 to 5: (1) "Strongly Disagree", (2) "Disagree", (3) "Agree", (4) "Strongly Agree" and (5) "Not Applicable". Data were entered into the PAM-13 online score sheet to obtain the activation score (1–100) and activation level (1: disengaged & overwhelmed, 2: becoming aware but still struggling, 3: taking action & gaining control, 4: maintaining behaviors & pushing further) for each patient. Since both level 1 and 2 are less numerous in COPD[12,13], PAM levels were dichotomized, as in other studies, into 'low activation' (PAM levels 1 and 2), and 'high activation' (PAM levels 3 and 4).

The secondary outcomes, which complemented the activity extracted from the accelerometer, were as follows: the percentages of moderate activity and inactivity (seated and lying), and others as the percentages of light activity and standing time. Other secondary outcomes were the BODEx index, Charlson score, COTE score, anxiety and depression score, FEV_1 (ml and

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percentage of the predicted value), age (years), weight (kg), and BMI (Kg/m^2) according to the activation level measured by the PAM-13 questionnaire.

Sample size

The initially estimated population to be recruited was calculated to produce a proportional increase of 43% in steps per day compared with a previous study[8]. The 51% estimate of losses according to the same study was probably conditioned with activation for 0.05 of alpha risk and 0.10 of beta risk. For the current study, we needed a minimum sample of 23 patients, as this was a unilateral test. To obtain a mean difference of at least 1548 steps/day between dichotomized MAP-13 levels, with an effect size of 0.72 according to a previous study[14], and an alpha risk of 0.05 and a beta risk of 0.20**,** a minimum of 25 patients per group as sample size would be required in a one-tailed test" .

However, as we were obliged by Insignia Health® (Oregon, United States) to conduct the PAM-13 questionnaire with 75 patients, which was the minimum number to obtain the research license, the latter sample size was used.

Statistical analysis

The level of significance used throughout the study was $p<0.05$. Data analysis was conducted using the statistical application SPSS, Version 22.

Previously, the normality of the variables was verified with the Kolmogorov-Smirnov test and the application assumptions of this test was used in our analysis. If the variables had been distributed according to the normal distribution, the paired Student's t (paired t-test) would be used to analyze the difference between means before and after the group session. Subsequently, the Student's t (t-test) would be used to analyze the difference between the change before and

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after the group session by pooled MAP levels. If the variables had not been distributed according to the normal distribution, the Mann-Whitney U test would be used to analyze the difference between the change before and after the group session by pooled MAP levels.

Spearman's Rho coefficient was applied to study correlation between number of steps, activity change and the PAM-13 questionnaire score, because this variable was not normally distributed.

Quantitative variables were described by mean±mean standard error or median and interquartile range (Me,IR) if they were not distributed normally. The descriptive variables of the sample were expressed qualitatively as frequencies and percentages. These variables included gender, smoking habit, hypertension, dyslipidemia, diabetes, obstructive sleep apnea-hypopnea syndrome, COPD phenotype, anxiety and depression dimensions, and the description of the level of PA.

Data from this study are available in excell format if requested.

RESULTS

A total of 214 patients with COPD were selected. Of these, 104 were excluded (five for not having a smart phone or not being familiar with the WhatsApp® mobile application, 59 for refusing to participate, 15 for not responding via telephone, two for cognitive impairment, two for not knowing the language, one due to death, another due to an amputated lower limb, 15 for concomitance with other pulmonary pathologies, one for suffering a serious psychiatric illness and three due to a COPD exacerbation). Of the 110 patients included in the study, 15 missed their appointment. Of those who started the study, two withdrew; 13 experienced technical problems related to the recording by the accelerometer, making it impossible to obtain the

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complete record; and five did not sufficiently use the accelerometer. Finally, 75 patients completed the study (Figure 1).

The descriptive characteristics of the patients included in the study are shown in Table 1.

When globally measured, daily PA was analyzed using an accelerometer, no significant differences were observed before and after the intervention for the number of steps and the rest of the variables (Table 2).

However, the median compliance with the PA program, as reported by the patients through their daily completion of the exercise chart, was 81.91% ± 44.76% (Table 3).

The median score on the PAM-13 questionnaire was 60.6; 14.6 (Me; IR) points.

The level obtained in the PAM-13 questionnaire is shown as a percentage in Figure 2. As can be seen, five participants were placed in level 1, 21 were placed in level 2, 34 were placed in level 3 (the most numerous) and 15 were in level 4.

As there were only five cases with activation level 1, we regrouped the four levels into two: the two lowest activation levels (1 and 2) and the two highest activation levels (3 and 4).

There were no significant differences in the mean number of steps per day between low- and high-activation patients during the week prior to the educational session (Figure 3). Significant differences were only observed between the pre-session and post-session means for patients with a high level of activation (Figure 3, Table 4).

The variations among the different variables collected in the study (accelerometer data, age, anthropometric data, the CAT and HADS questionnaire, and clinical indices) were analyzed with the pooled results of the PAM-13 questionnaire (Tables 4 and 5).

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The group with the highest activation level (Group 3-4) demonstrated an increase in the number of steps per day after the educational session. However, the group with low activation (Group 1-2) decreased the number of steps.

The group with the highest activation level (Group 3-4) demonstrated an increase in the time dedicated to activities of moderate intensity after the intervention. Both age and the Charlson index were also higher in this group. In the group with less activation (Group 1-2), the time they remained inactive was greater, as was the individual weights of the participating subjects.

The correlation between the PAM-13 scores and accelerometer activity was also analyzed. The findings showed a correlation between the change of steps and moderate activity and standing time, as well as an inverse correlation with inactive time (Table 6).

DISCUSSION

One of the problems with the failure of rehabilitation programs to increase activity is the resistance of patients to enter the programs or the ease of withdrawing from them. The reasons for these situations are futile, and in many cases, there is no reasonable reason from patients for their withdrawal. Identifying these vulnerable patients will help us in the outcome of the programs[15,16].

The PAM-13 scale measures the level of empowerment and self-management of patients with chronic diseases, such as COPD[17]. The current study was designed to determine whether the score on the scale predetermines the patient's response to an educational session.

The patients, who did not enter the follow-up, did not differ from those who later enrolled the study, except for 16 patients, 15 of them had myocardial dysfunction that could infer in the

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results of the study and one severe psychiatric alteration that interfered with the follow-up, 15.38% of those rejected and 7.4% of the total.

Overall, the educational intervention did not lead to an increase in the number of steps or activities, as indicated in the literature[6]. However, when the patients were subdivided by their degree of activation prior to the educational intervention, as measured by the PAM-13 scale, it became evident that the patients with the highest activation were the most positively influenced by the educational intervention. On the one hand, the intervention increased their number of daily steps (there was more than a 1000-step difference between the high- and low-activation groups) and the time they dedicated to activities of moderate intensity. On the other hand, they decreased their inactive time.

This confirms that the PAM-13 questionnaire, as its own authors pointed out, is useful for designing interventions in a clinical setting and that such interventions on activated patients should be designed to increase their knowledge, skills, and confidence in self-management[6]. A curious fact that reinforces the strength of this questionnaire to predict a positive response to a simple educational intervention was that, unlike other studies in which the presence of comorbidities or age negatively influenced activation[18], we observed that the more activated patients and, therefore, those with better responses after the intervention, had more comorbidities or were older. Similarly, our study did not observe that the severity of the obstruction before an educational intervention influenced the results[18]. In addition, that greater activation determined greater daily activity after educational intervention was not found to be conditioned by the impact of COPD on health or quality of life. In contrast, prior studies have suggested that activation is conditioned by the impact on health, as determined by CAT[19].

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The HADS questionnaire was used because it is known that more sedentary patients with COPD or older have higher levels of anxiety and depression[20,21]. However, in our study, we found no differences in mood according to the level of activation, and it did not influence the response to exercise.

The literature further shows that low levels on the PAM-13 (1 and 2) questionnaire are associated with a poor state of health, greater dyspnea, and lower BMI[22]. However, in our study, there was no difference in BMI between activated and non-activated patients.

Our study also objectively demonstrated concordance between the PAM-13 questionnaire and the reality of self-management in the promotion of PA in daily life. This finding is in contrast to the conclusions of other authors, who question this objective concordance in patients with chronic respiratory diseases, such as cystic fibrosis[23]. These authors argued that patients answered to the PAM-13 questionnaire, so they should have done more than what they actually did an argument they confirmed, when they objectively determined adherence to inhalers[23]. However, when we objectively verified patient activity using actigraphy, we detected differences. This result is consistent with the finding of a cross-sectional study on a population, in which a quarter of the participants were COPD patients: the greater the activation detected by the PAM-13, the stricter the adherence to prescribed medication[24].

Another striking fact is that patients with low activation decreased their amount of steps/day after the educational intervention. We do not believe that education has a deleterious effect on patients. Our explanation is that the patients who agreed to join the study, who were given an explanation about the study, and provided with an actigraph to monitor their usual daily activities prior to the session, most likely suffered from a Hawthorne[25] effect, which increased their activity. However, the educational session may have been unable to meet their expectations, so

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they returned to their usual activities. In fact, patients with low PAM-13 scores are often dissatisfied with the proposals offered by doctors to manage their disease[22] and feel little support from them[26]. The paradox is that this effect could be used experimentally in patients with low activation, with a rehabilitation program managed within the usual clinical care of these patients. This could be achieved without generating great expectations beyond interactive telemonitoring that increases their activity[27].

In our study the patients demonstrated a high degree of activation, thus implying a high degree of individual competence regarding the assumption of new behaviors and efforts to manage their health[28]. Such high activation would be conditioned by the predisposition to participate in the study, as it was conducted outside the usual visits.

In addition, the procedure used to inform and recruit participants, a telephone call with a pneumologist, have had an influence on communicating a warmer welcome and creating a more favorable environment for the integration of the team in patient care than did prior studies that conducted recruitment by mail[29,30]. This level of activation, higher than that recorded in other studies, was probably also influenced by our exclusion of patients with exacerbations. Prior studies that included these patients reported a higher degree of comorbidity, as reflected in the Charlson index, and a greater impact on quality of life, as reflected by a higher score on the CAT questionnaire[31].

In fact, in COPD, it has been observed that activation levels 1 and 2 are associated with a poorer state of health and a greater number of exacerbations, as determined by the number of visits to the doctor[22]. Other studies have presented higher levels of activation because younger patients with less comorbidity participated in such studies, thus ensuring a higher level of participant activation[22]. Finally, the degree of activation in our study was also influenced by the fact that all

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our patients knew how to read: One study found a link between low literacy lower level of activation and inadequate self-management[32].

Furthermore, adherence to the exercise program proposed after the educational intervention was superior to that in the pilot study, in which the 'on your feet to earn your seat' principles[11] were introduced: in its intention-to-treat analysis, an average adherence of 52.99% was observed for each of the exercises during the second week of the program.

As some authors have pointed out, given the great variation in the effectiveness of COPD interventions, it is unlikely that any single intervention can be adapted for all patients[33,34]. Similarly, health professionals cannot apply just one approach[35]. Therefore, using PAM-13 to identify COPD patients who are activated by an educational group is a cost-effective strategy for implementing effective and targeted interventions. On the other hand, the PAM 13 questionnaire identifies low-activation COPD patients who would not benefit from this simplified intervention. They would need to acquire knowledge jointly a cognitive behavioral therapy program includes psychological coping for a sustainable behavior[36].

Limitations

This study has limitations in terms of duration of effect because the evaluation was conducted in the short term. Higher self-completed adherence outcomes of up to 64% have been observed in COPD patients after eight weeks of intervention, but those studies have six-month monitoring periods[37]. Thus, it would be worthwhile to evaluate this situation in the longer term. Accepting this situation, the difference in activity, at least in the number of steps, because of a group session provides a hopeful answer. Nevertheless, long-term monitoring studies are needed to determine the duration of the session effect.

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Further limitations were that the study was carried out at a single collection site, which excluded people without a level of medical literacy to understand the proposed tests or did not use a smart phone.

Other limitations were that the observed effect may also be conditioned by a regression to the mean that we could estimate at 14%. A study designed with randomization of two groups, one with no intervention and one with intervention, according to the level of activation, would provide an estimate of the regression effect to the mean in the variation of steps through the control group and provide more definitive conclusions.

Conclusion

COPD patients with levels greater than or equal to 3 in the PAM-13 questionnaire are likely to improve their physical activities after attending an educational group session.

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AUTHOR CONTRIBUTION

María C. Fernández-Sánchez: data curation, formal analysis, investigation; Francisco J. Ruiz-López: conceptualization, project administration, supervision; José A. Ros-Lucas: investigation, methodology, resources; Rubén Andújar-Espinosa: formal analysis, writing original-draft; Juan Del Coso: methodology, resources; Teresa García-Pastor: methodology, resources.

DECLARATION OF INTEREST

The authors report there are no conflicts interests to declare.

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Table 1. Descriptive characteristics of the patients in the study.

Characteristics of the patients	**n (%)**	**mean±MSE /median&IR**
Gender: Male Female	 56 (74.7) 19 (25.3)	
Age (years)		63.8 ± 0.8
Smoking habit: Active smokers Former smokers	 43 (57.3) 32 (42.7)	
Cumulative tobacco (packs-year)		40&33.75
BMI Kg/m^2		29.03 ± 0.66
COPD phenotype: Chronic bronchitis Emphysematous Mixed phenotype	 29 (38.7) 28 (37.3) 18 (24)	
FEV1 ml % predicted value		 1731.4 ± 63.5 60.5% ± 1.4%
FVC ml % predicted value		 3064 ± 91.9 83.4% ± 1.7%
FEV1/FVC ratio %		59&17
CAT score		14&14
BODEx index		1&1
Dysnea (mMRC)		1&1
Cardiovascular risk factors: Hypertension Dyslipidemic Diabetic Mild obstructive sleep apnea	 40 (53.3) 33 (44) 18 (24) 33 (44)	
Charlson index		4&11
COTE index		0&1
Anxiety dimension (HADS questionnaire): Anxiety Anxiety probable Normal Missing data	 9 (12) 24 (32) 41 (54.7) 1 (1.3)	7&5
Depression dimension (HADS questionnaire): Depression Depression probable Normal Missing data	 8 (10.7) 13 (17.3) 53 (70.7) 1 (1.3)	5&6
IPAQ questionnaire: MET-min Sitting-min Level of physical activity: Low intensity Moderate intensity Intense intensity	 23 (30.7) 35 (46.7) 17 (22.7)	 11.9&69.6 270&293

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n (number of patients). % (percentage of patients). MSE (Mean standard error). IR (interquartile range)

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Table 2. Daily physical activity measured by the accelerometer before and after the educational intervention. Student's t (paired t-test) was used to analyze the difference between means before and after the group session.

Variable	Mean ± MSE	Variation	p
Nº steps (before) Nº steps (after)	11435,25 ± 433,13 11672,76 ± 431,25	-237,51 ± 228,89	0,303
% Actv. Light (before) % Actv. Light (after)	74,8 ± 1,07 75,07 ± 1,06	-0,267 ± 0,78	0,732
% Actv. Moderate (before) % Actv. Moderate (after)	23,53 ± 0,96 24,93 ± 1,06	-1,400 ± 0,76	0,068
% standing (before) % standing (after)	35,75% ± 1,13 36,03% ± 1,10	-0,273 ± 0,65	0,677
% inactive (seated and lying) (before) % inactive (seated and lying) (after)	64,25 ± 1,13 63,98 ± 1,10	0,273 ± 0,65	0,677

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Table 3. Adherence to each of the principles "on your feet to earn your seat".

Adherence to each of the principles "on your feet to earn your seat"	**Percentage**
1 A. Calf stretches	78,90%
1 B. Chest stretches	66,29%
1 C. Walking in tandem	72,14%
1 D. Walking without displacement	58,30%
1 E. Move your fingers around the wall	66,71%
1 F. Lift weights with cans of food	69,88%
2. Leave home every day.	67,64%
3. Watch your steps.	67,19%
4. Wait on foot.	67,64%
5. Perform push-ups against the wall.	67,19%
6. Get up and sink.	60,44%
7. Take active advertisement breaks.	64,03%
8. Time to stretch.	61,33%
9. Get up without resting your hands.	60,88%
10. Improve your posture.	67,64%

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Table 4. Analysis of the variables that follow normal distribution. Student's t was used to analyze the difference between change means before and after the group session by pooled PAM levels. Student's t (paired t-test) was used to assess the mean differences between means before (baselines values) and after the group session.

Variable	**PAM level pooled**	**n**	**Mean±MSE**	**p**
Nº steps (before) Nº steps (after)	1-2 1-2	26 26	12282.50±868.62 11686.07±854.43	0.162
Nº steps (before) Nº steps (after)	3-4 3-4	49 49	10985.69±471.18 11665.69±486.91	0.010*
Change in steps	1-2 3-4	26 49	-596±42 680±253	0.007*
Change standing time	1-2 3-4	26 49	-69±96 140±96	0.157
Weight	1-2 3-4	26 49	87.37±4.11 78.93±2.15	0.048*
BMI	1-2 3-4	26 49	30.85±1.41 28.07±0.64	0.080
Age	1-2 3-4	26 49	61.50±1.17 65.04±1.02	0.034*
FEV1 (ml)	1-2 3-4	26 49	1820±104.37 1684.49±79.96	0.314
FEV1 (%)	1-2 3-4	26 49	59.62 61.02	0.647
CAT	1-2 3-4	26 49	16.12 14.76	0.523
Depression score	1-2 3.4	26 49	5.31 5.04	0.775

* $p<0.05$ significant difference between pooled PAM levels. MSE mean standard error.

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Table 5. Analysis of variables that do not follow normal distribution. Non-parametric Mann-Whitney U test was used to analyze the difference between change means before and after the group session by pooled PAM levels

Variable	PAM level pooled	n	Average range	p
Change % actv. Light	1-2 3-4	26 49	42.04 35.86	0.242
Change % actv. moderate	1-2 3-4	26 49	28.42 43.08	0.006*
Change % Inactive time	1-2 3-4	26 49	45.04 34.27	0.042*
BODEx	1-2 3-4	26 49	36.73 38.67	0.701
Charlson	1-2 3-4	26 49	31.25 41.58	0.043*
COTE	1-2 3-4	26 49	38.83 37.56	0.753
Anxiety score	1-2 3-4	26 49	39.21 35.57	0.613

* $p<0.05$ significant difference between pooled PAM levels.

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Table 6. Correlation between the PAM-13 score and the accelerometer activity.

Variable	ρ	P
Change Nº steps	0,280	0,015*
Change Actv. Light	-0,160	0,169
Change Actv. Moderate	0,280	0,015*
Change standing time	0,253	0,028*
Change inactive time	-0,253	0,028*

ρ (Spearman's Rho coefficient). Actv. (Activity) *p<0.05 significant.

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FIGURE LEGENDS

Figure 1. CONSORT flow diagram showing participant flow through each stage of the study (assessed for eligibility, excluded, enrolled, lost follow up and analyzed).

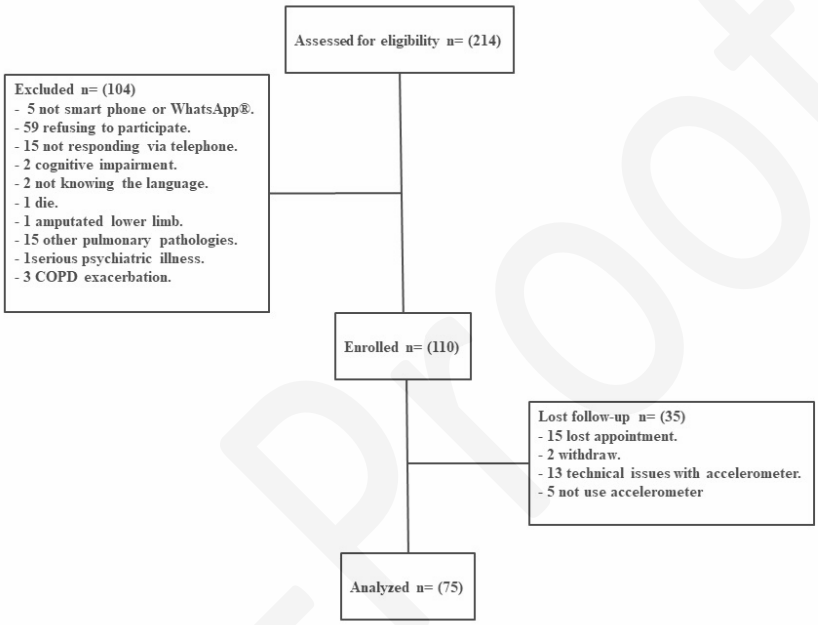

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Figure 2. Distribution in percentage by PAM-13 level.

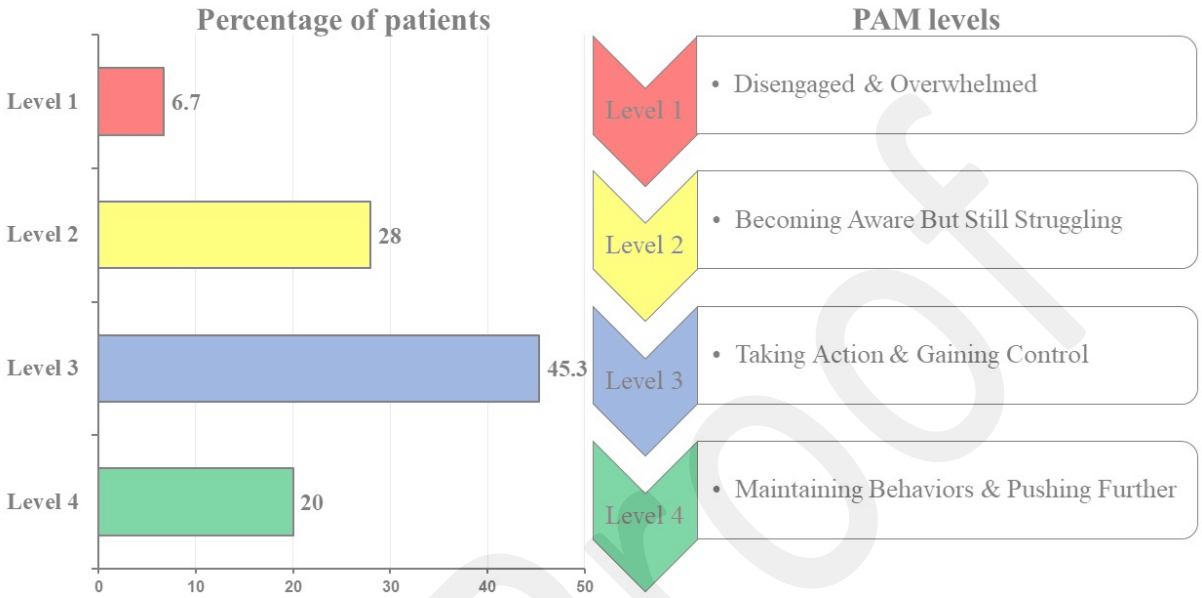

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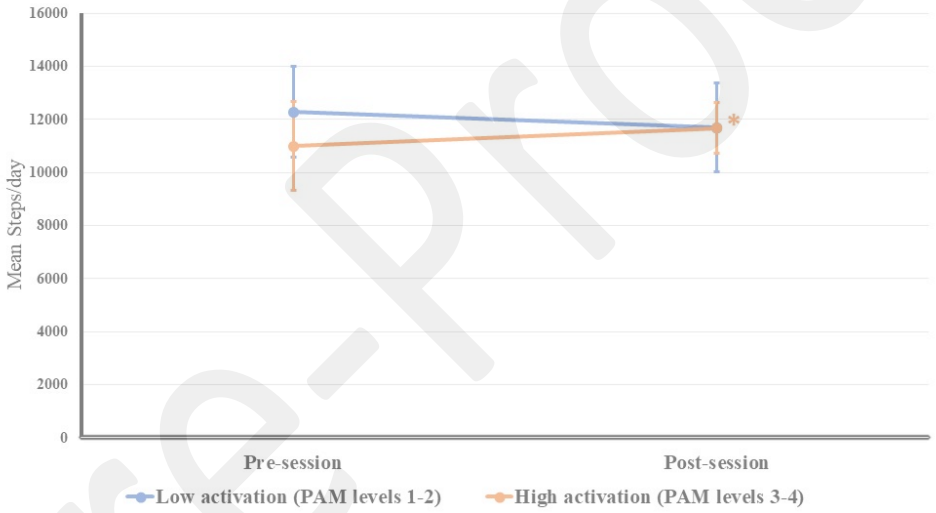
Figure 3. Average values of the amount of steps/day per week prior to the educational session and after the educational session, according to the pooled PAM-13 activation level. The bars represent the limits of the 95% confidence interval of the mean. No significant differences were observed between the values. No significant differences were observed between PAM levels pooled pre-session educational neither between PAM levels pooled post-session educational. * Significant differences were observed only between the pre-session and post-session means for patients with a high level of activation ($p<0.01$).



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Online Data Supplement

Principles of the programme "on your feet to earn your seat"[6]

These principles are based on the repeated performance of an action in a particular context to reinforce the context-behaviour association. In this process, the habitual response first becomes dominant in the memory. Then, as the habit is formed, control over the onset of action becomes less dependent on memory, attention, and motivation, making the behaviour automatic and easier to perform.

The designed intervention based on these principles consisted of a practical explanation of the 15 tips proposed by the program[11] to interrupt sedentary habits, a goal that was achieved by integrating activity habits through context-dependent repetition. In addition to explaining each principle, the participants were provided with practical examples of other everyday situations in which they could apply the principles. They were encouraged to do so in as many situations as possible. They were also informed of the benefits to their health provided by each exercise.

1.**Principles of the programme "on your feet to earn your seat"[6]**
1 A. Calf stretches
1 B. Chest stretches
1 C. Walking in tandem
1 D. Walking without displacement
1 E. Move your fingers around the wall
1 F. Perform weights with food cans
2. Leave the house every day: Be sure to go out at least once a day.
3. Watch your steps: Try to walk at least 30 minutes a day.
4. Wait on foot: When you have to wait for the bus or train, do it on foot.
5. Perform 10 push-ups against the wall every morning.
6. Get up and sink: when you are in front of the kitchen sink, tiptoe and descend on your heels; at least five times.
7. Take active advertisement breaks: When watching TV, get up and move around the room on ad breaks.
8. Time to stretch: When sitting for long periods of time, set an alarm every 20 minutes, get up and stretch at least five times.
9. Get up without resting your hands: Every time you get up from the chair, do it without resting your hands.
10. Improve your posture: turn your back to the wall, with your feet at 5 cm, and rest your head on the wall.

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2. **Template (with magnets to hang on the refrigerator) to self-complete daily for the patient.**
At the end of the session, the participants were provided with complete information in writing, after which they were given a template (they could hang on the refrigerator using magnets) to self-complete daily upon completing the various proposed exercises.

Exercises	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7
1 A. I've performed calf stretches.							
1 B. I've performed chest stretches.							
1 C. I've walked a tightrope.							
1 D. I've walked without displacement.							
1 E. I've moved my fingers around the wall.							
1 F. I've lifted weights.							
2. Today I left home.							
3. I've walked 30 minutes.							
4. I've waited standing.							
5. I've performed 10 push-ups against the wall.							
6. I've done exercises before opening the refrigerator.							
7. I've stretched during the ads.							
8. I've stretched every 20 minutes when I've been sitting .							
9. I got up without supporting my hands.							
10. I have maintained the position.							

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3.Feed-back after the group session via Whatsapp®,
Questions
1. Have you walked more today than yesterday?
YES/ NO
2. Have you gotten up in TV ads?
YES/ NO
3. Do you stand up and tiptoe as you were taught?
YES/ NO
4. Did you remember to get up without supporting your hands?
YES/ NO
5. Have you flexed your arms and stretched your chest?
YES/ NO
Feed-Back based on the answers:

- Four or five negative responses

Answer:
Surely tomorrow you can improve!

- Two, three or four affirmative answers

Answer:
Cheer up, you lack a little!

- All affirmative answers

Answer:
All right, keep it up!

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