Feasibility of an e-Health-based physical activity coaching intervention during pulmonary rehabilitation for people with COPD

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Table of Contents

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Abstract

Physical inactivity is a modifiable and significant trait in people with COPD. While traditional exercise-based pulmonary rehabilitation (PR) improves symptoms and exercise tolerance, its impact on physical activity (PA) levels remains limited. Digital health (eHealth) interventions may help address this gap. This study assessed the feasibility of integrating an eHealth PA coaching intervention into PR for people with COPD.
Patients enrolled in an outpatient PR programme were recruited for a 3-week PA coaching intervention, which used a smartband connected to a mobile patient app and a web app for healthcare professionals (HCPs). The intervention included PA monitoring (steps/day), weekly goal setting, and application (app) notifications for goal updates, achievement, and motivational messages. Weekly telephone calls supported goal adjustment and identification of PA barriers. The acceptability of the intervention was explored through a patient focus group.
Five patients with COPD (67±9 years, 4 female; FEV1 49±23%pred) participated. The recruitment rate was 83%, with 100% retention and adherence to the intervention (daily synchronisation). No adverse events or PA barriers were identified. One reported app connection issue was resolved by restarting the app. Patients found the app easy to use and helpful for their PA and remote monitoring by healthcare professionals (HCPs). Weekly goal adjustments and HCP contact were valued. Limitations regarding the app's use included a lack of personalisation, goal setting restricted to steps, and occasional step miscounts.
The intervention was feasible and well-accepted. Future studies with a larger sample are needed to assess the impact of the intervention on PA outcomes.

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ABSTRACT

Physical inactivity is a modifiable and significant trait in people with COPD. While traditional exercise-based pulmonary rehabilitation (PR) improves symptoms and exercise tolerance, its impact on physical activity (PA) levels remains limited. Digital health (eHealth) interventions may help address this gap. This study assessed the feasibility of integrating an eHealth PA coaching intervention into PR for people with COPD.

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Five patients with COPD (67±9 years, 4 female; FEV_1 49±23%$_{pred}$) participated. The recruitment rate was 83%, with 100% retention and adherence to the intervention (daily synchronisation). No adverse events or PA barriers were identified. One reported app connection issue was resolved by restarting the app. Patients found the app easy to use and helpful for their PA and remote monitoring by healthcare professionals (HCPs). Weekly goal adjustments and HCP contact were valued. Limitations regarding the app's use included a lack of personalisation, goal setting restricted to steps, and occasional step miscounts.

The intervention was feasible and well-accepted. Future studies with a larger sample are needed to assess the impact of the intervention on PA outcomes.

Contribution of paper:

1. Feasible to integrate eHealth PA coaching into pulmonary rehabilitation, with high adherence and no adverse events.
2. Well accepted by patients, who valued goal setting, feedback, and healthcare professionals' support.

Keywords:

COPD, eHealth intervention, physical activity, pulmonary rehabilitation

INTRODUCTION

Chronic obstructive pulmonary disease (COPD) is a highly prevalent lung disease that imposes a significant burden on the healthcare systems and is a major cause of long-term disability [1]. Physical inactivity is a crucial treatable trait in COPD, as it is related to increased risk of exacerbations, hospitalisations and mortality [2]. Thus, improving physical activity (PA) levels in these patients is a global priority [1].

Pulmonary rehabilitation (PR) is a non-pharmacological and evidence-based intervention known to improve symptomatology and functional performance in patients with COPD [3-5]. Exercise training is considered a cornerstone of PR. Previous studies have found inconsistent results regarding the impact of exercise-based PR on patients' PA levels. This suggests that behavioural interventions like PA coaching should be integrated into PR to optimise promotion of an active lifestyle [6-8]. This strategy allows clinicians to detect and intervene early in case of low PA adherence [9].

Therefore, it is crucial to develop strategies to optimise patients' PA during and after the PR. PA coaching can be supported by Information and Communication Technologies such as eHealth, including mobile applications (apps), as their use is increasingly common in everyday life [10], and technology is embedded into the healthcare systems [11]. Mobile apps can monitor PA in real-time, allowing automated and continuous self-monitoring and feedback on the PA performed [12], enabling the burdenless measurement of activity with acceptable accuracy [13], and continuous access to recorded data (longitudinally and in real-time) [12].

Interventions, such as PA coaching using eHealth, should first be assessed for feasibility and acceptability to ensure their optimisation before conducting a more robust study on their effectiveness [14]. Thus, this study aimed to determine the feasibility and acceptability of a PA coaching intervention using an eHealth platform in patients with COPD attending a PR program.

MATERIAL AND METHODS

Design

This was a single-group feasibility study which investigated a 3-week intervention of a PA coaching intervention implemented during a PR programme. This study is part of the Effectiveness of Physical Activity Coaching using E-Health in patients with COPD (PACE) study, which aims to assess the effectiveness of a personalised eHealth coaching intervention integrated into PR to increase the PA levels in people with COPD. This feasibility study was reported in accordance with guidelines for reporting pilot and feasibility studies (adjusted for a single-arm study) [14-16] and was approved by the Ethics Committee of the institution involved, i.e., the Local Health Unit of the Leiria Region.

The focus of this study was on the feasibility and acceptability of the intervention, specifically to test the decision algorithm and assess the receptivity and acceptance of the intervention, including the digital platform, to identify any necessary adjustments for its implementation in a larger study. For this purpose, three weeks were needed for patients to interact with the platform, test its acceptability, and refine the algorithm.

Participants

Potential participants were recruited from the Local Health Unit of the Leiria Region according to the following inclusion criteria: age > 40 years old, diagnosis of COPD according to GOLD criteria [1], clinically stable (i.e., with no exacerbations in previous month), attending the PR programme at the hospital and able to understand and provide informed consent. The exclusion criteria were simultaneous participation in another PA behavioural modification programme; not having a smartphone; having a clinical condition that could preclude participation in a PA intervention (e.g., severe musculoskeletal or neurological disorders); other primary respiratory disease; unstable cardiovascular disease and/or history of recent neoplasia (including last treatment) in the previous year.

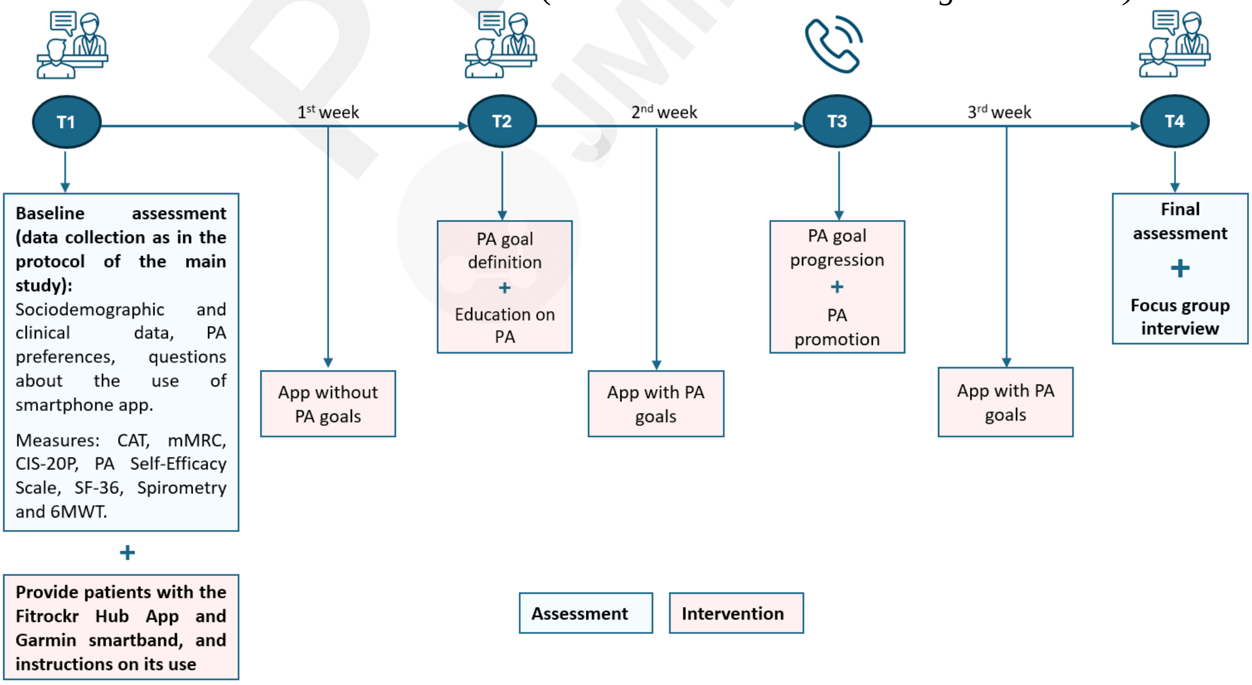
The physician responsible for the PR programme identified the eligible patients and briefly explained the study to them. Those interested in participating were then contacted by the researcher via telephone to inform them about the study procedures (data collection, dates, and intervention delivery), confirm their eligibility, and ask about their willingness to participate. Reasons for not participating were recorded. Patients who agreed to participate signed the written informed consent before any data collection.

Procedures

This study included four interaction moments with patients as described in . The assessments took place at baseline (T1) and 3 weeks after, corresponding to the end of the intervention (T4). The time points of the intervention and assessment moments are detailed in Table 2.

In the baseline assessment (T1), participants completed a questionnaire with sociodemographic and health-related information (i.e., age, sex, educational level, occupational status, smoking history, comorbidities using the Charlson Comorbidity Index [17], exacerbation history, medication, weight and height), preferred physical activities (e.g., walking, swimming, dancing) and questions about the type and features/apps used on their smartphone. Lung function was assessed through spirometry [18] to further classify patients based on GOLD grades of airflow obstruction severity (GOLD 1: $FEV_1 \geq 80\%$ predicted; GOLD 2: $50\% \leq FEV_1 < 80\%$ predicted; GOLD 3: $30\% \leq FEV_1 < 50\%$ predicted and GOLD 4: $FEV_1 < 30\%$ predicted) [1]. GOLD ABE was determined according to the patients' exacerbation history and symptoms [1]. The impact of COPD on daily living, dyspnoea, fatigue, exercise tolerance, quality of life, and self-efficacy for PA were also assessed, as described in detail in the topic below "Secondary outcome measures (health-related outcomes)."

Then, patients received the PA mobile app paired with a smartband to use for 1 week, establishing their baseline step count for goal setting in the following weeks. In a second moment (T2 – end of the first week), patients received education on the importance of PA and recommendations and agreed on the first PA goal set. In the third moment (T3 – end of the second week), the researcher reviewed the achievement of the previous PA goal, explored barriers to PA behaviour and potential adverse events, and set the next goal with the patient through a telephone call. One week later (T4 – end of the third week), patients returned the app and the smartband and were reassessed as in T1. A focus group interview with patients was also conducted to assess their feedback on the PA coaching intervention, including their experience with new technology, perspectives on the importance of PA promotion interventions, app functionality, acceptability, barriers, and facilitators of its use. The intervention is described in detail below (see *Intervention - PA coaching intervention).*



***Legend**: 6MWT, 6-Min Walk Test; App, application; CAT, COPD Assessment Test; CIS-20P, Checklist of Individual*

Strength; mMRC, modified Medical Research Council Scale; PA, Physical Activity; SF-36, MOS Short-Form Health Survey 36 Item v2.

Figure 1 – Design of the feasibility study.

Table 2 - Timepoints of the intervention and assessments.

TIMEPOINTS	T1	Week 1	T2	Week 2	T3	Week 3	T4
ASSESSMENTS							
Sample characterisation							
Sociodemographic data							
Smartphone use							
Lung function (Spirometry)							
Impact of the disease (CAT)							
Dyspnoea (mMRC)							
Fatigue (CIS-20P)							
Quality of Life (SF-36)							
Self-Efficacy for PA (Self-Efficacy for PA Scale)							
Exercise tolerance (6MWT)							
Acceptability variables (focus group)							
Feedback about intervention							
Feedback about functioning of the app							
Feasibility variables							
Recruitment rate							
Adherence to the intervention							
Dropout rate and reasons							
Intervention safety (adverse events, unplanned healthcare use)							
Technical issues about app functioning (self-reported)							
Duration and content of the weekly telephone calls							

Intervention

eHealth platform for PA coaching

The eHealth platform used in this study was the *Fitrockr Hub App* (Fitrockr Health Solutions, Berlin, Germany), that includes two applications – a web app for healthcare professionals and a mobile app for patients. This eHealth platform enables tailoring PA coaching to each patient by monitoring patients' adherence to predefined PA goals and enabling individualised notifications.

The Fitrockr Hub App platform comprises two applications – a web app for healthcare professionals and a mobile app for patients. The mobile app synchronises with a Garmin smartband (Garmin Vivosmart 4; Garmin, Kansas, United States), which allows for PA monitoring (i.e., steps, distance, and calories), access to PA history (in days), daily PA goals (defined in the web app), and notifications on the patient's performance based on the fulfilment of their personal goals. The web app for the healthcare professionals allows them to monitor patients' daily PA to define and/or change individualised goals, which will then appear on the homepage of the mobile app. Through the web page, healthcare professionals can also insert new patients, prescribe personalised PA goals for each patient (i.e., steps), monitor their daily PA activity (e.g., observe how many steps they do on a given day), check whether patients met their prescribed goals and send personalised notifications. The data can be exported to Excel files for further analysis.

PA coaching intervention

Patients were asked to wear the Garmin's smartband (Garmin Vivo Smart 4) connected to the Fitrockr Hub App every day for one week to set their baseline steps (T1). As the mobile app does not synchronise automatically with the smartband, patients were asked to manually synchronise them twice a day (i.e., upon awakening and before retiring for the night), every day, by clicking a button in the app.

After the first week (T2), patients received information about the importance and recommendations of PA, and the first PA goal was set (in person). The personalisation of the goal was based on an algorithm (Figure 2) that considered the amount of PA performed in the previous week (i.e., the average number of daily steps in the last 7 days) and patients' confidence in changing the goal. The "confidence" level was then translated into a percentage increase from the previous goal, and the adjusted goal was then displayed in the Fitrockr Hub App. To avoid the risk of injuries and to ensure tolerability, the weekly increase in PA goals did not exceed 10% [19]. During the week, patients received an automatic notification every day at 6 PM about their goal achievements, providing them with the opportunity to increase their PA to reach their daily goal if needed. During the intervention, patients received sporadic personalised notifications sent manually by the researcher (e.g., notifications about bad weather suggesting indoor activities, incentive messages). At the end of the second week (T3), patients received a telephone call to check their PA progression. If patients did not achieve their goals in the previous week, the researcher asked them to identify potential barriers to PA improvement and discussed possible strategies to overcome them (examples are provided in supplementary material 1). Then, the goal for the next week was set according to the algorithm presented in Figure 2. During the intervention, patients were allowed to contact the researcher by telephone to receive technical support, if needed.

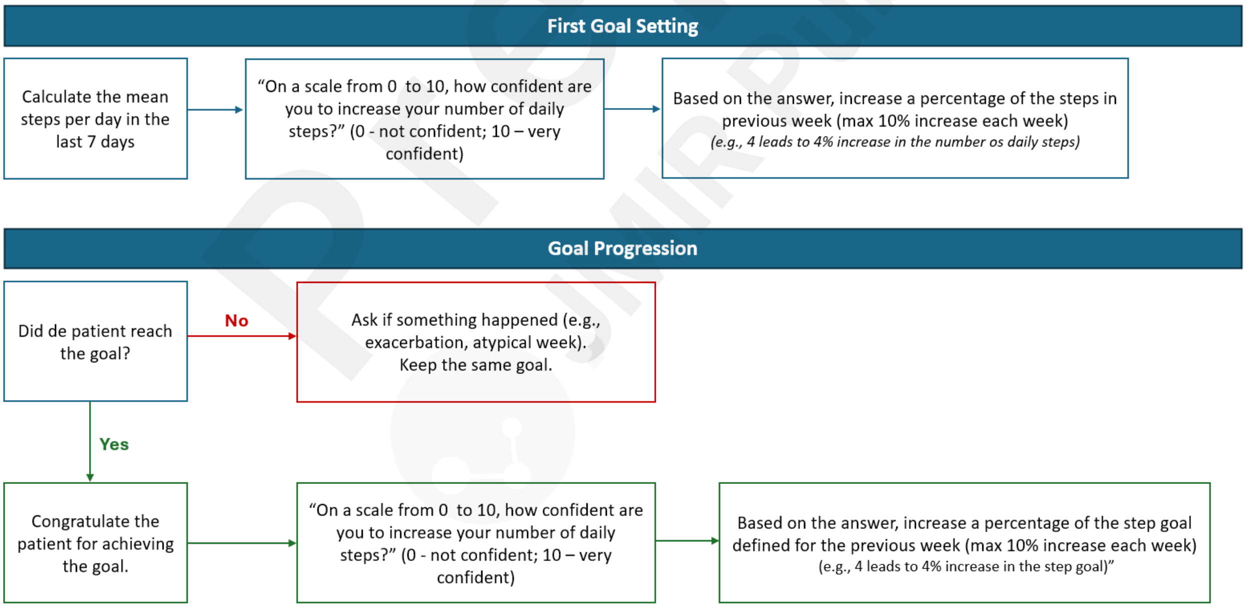


Figure 2 - Algorithm for goal setting and progression of physical activity coaching.

Reasons for not progressing the goals, as well as possible adverse events and technical issues related to app functioning, were recorded. The diary of telephone calls and goal progression was recorded and is provided in supplementary material 2.

Since PA is a complex behaviour [20], the intervention included several behaviours change techniques (BCTs), according to the BCT Taxonomy v1 [21], included goals and planning, feedback and monitoring, natural consequences, repetition and substitution, comparison of outcomes and self-belief. More information on how these BCT were implemented is provided in supplementary material 3.

Outcomes

Primary outcomes

Feasibility

Feasibility was defined as the extent to which the intervention can be successfully implemented within a given setting/larger study [22]. Feasibility was evaluated through the following parameters assessed during the intervention:

Feasibility of the study design:

- Recruitment rate (%) = (n. of recruited patients ÷ n. of eligible patients) × 100
- Study retention (%) = percentage of patients who completed the intervention and data collection. The expected recruitment rate and study retention were 80%, at least [15].
- Dropout rate (and its reasons) = (n. of dropouts ÷ n. of patients recruited) × 100

Feasibility of the intervention:

- Adherence to intervention (%) was assessed by the number of days patients had synchronised the app with the smartband throughout the intervention, regardless of whether they achieved the goal.
- Intervention safety = adverse events and/or unplanned healthcare use (self-reported)
- Technical issues about app functioning (self-reported)
- Duration and content of the telephone calls.

Acceptability

Acceptability was defined as the extent to which patients receiving the intervention considered it appropriate to promote PA during PR [23]. Acceptability was assessed through a focus group interview with a semi-structured guide and audio-recorded for posterior transcription and analysis. The focus group interview guide is provided in supplementary material 5, and topics covered were the following:

- Feedback about the intervention - questions about patients' experience with the intervention, specifically the importance of this type of intervention to improve their PA levels, barriers and facilitators to the use of mobile apps to promote PA, goal setting and progression, notifications, and health professionals' contact.
- Feedback about the functioning of the app - questions about barriers and facilitators of app usage: the experience of interacting with the smartphone app and the smartband, as well as the degree of technological complexity.

Secondary outcome measures (health-related outcomes)

Given the short duration of the intervention (3 weeks), no changes in health-related outcomes were expected. However, these measures were included in assessment moments to replicate the procedures of the subsequent RCT data collection processes. Functional exercise capacity was measured using the 6MWT [24], and predicted values were computed using the equation developed for Portuguese adults [25]. The test was conducted in a 30-meter corridor according to guidelines from ERS/ATS [26]. Vital signs were measured before and after the test [27], and symptom scores for dyspnoea and fatigue were assessed using the modified Borg scale [28]. The impact of COPD in daily living was assessed through COPD Assessment Test (CAT) [1]; dyspnoea with the modified Medical Research Council dyspnoea scale (mMRC) [29]; quality of life with the MOS Short-Form Health Survey 36 Item v2 (SF-36) [30, 31]; and self-efficacy for PA with an adapted version of the Physical Exercise Self-Efficacy Scale (adapted with the authors' permission) [32]. The fatigue was measured with the Checklist of Individual Strength (CIS-20) and categorised into 3 categories (normal fatigue - score ≤26; mild fatigue - score between 27-35, and severe fatigue – score ≥36) [33].

Data analysis

The data collected through the focus group interview were analysed using a qualitative methodological approach (i.e., Grounded Theory [34]). The participants were coded through an alphanumeric code (P1, P2…) during the data analysis. Themes and categories were created in an Excel sheet, enabling the identification of the main topics discussed by the patients [35]. This process was primarily developed by two researchers independently. Then, the two researchers met to systematically compare the coding and themes and establish a consensus. After no new categories were produced, the information was organised into a descriptive framework [36]. Descriptive statistics were used to characterise the sample using IBM SPSS Statistics® (v.28.0).

RESULTS

All patients were recruited in March 2024, and the follow-up lasted until May 2024. Six (n=6) patients participating in an outpatient PR programme were eligible for recruitment; however, one refused to participate due to lack of interest, therefore, the final sample consisted of 5 patients.

Patients' characteristics

Patients had a mean age of 67.0 ± 8.9 years and a mean predicted FEV_1 of 49.0 ± 22.8%, indicating a population with moderate to severe airflow limitation. The sample was predominantly female (n=4, 80%), with most patients classified as GOLD E (n=4, 80%), suggesting a high risk of exacerbations and symptom burden. Regarding educational level, 60% (n=3) completed 10 to 12 years of formal education, and all patients were retired (n=5, 100%). The mean CAT score was 13.0 ± 9.0. Fatigue levels, assessed using the CIS20-P, showed a score of 78.4 ± 28.9. Dyspnoea severity, as measured by the mMRC scale, had a median score of was 3.0 [0.5; 3.5]. On average, each assessment session lasted approximately 40 minutes. Characteristics of participants are presented in table 4.

Table 1 - Participants' sociodemographic and clinical characteristics presented as mean ± standard deviation for continuous variables, and number (percentage) for categorical variables).

Characteristics	Total (*n*=5)
Age (years)	67.0 ± 8.9
FEV_1% pred	49.0 ± 22.8
BMI (kg/m^2)	26.3 ± 8.7
Sex, n (%)	
Female	4 (80)
Male	1 (20)
Education level, n (%)	
5 – 9 years of education	1 (20)
10 – 12 years of education	3 (60)
Higher education	1 (20)
GOLD Classification, n (%)	
GOLD A	1 (20)
GOLD E	4 (80)
GOLD Classification, n (%)	
GOLD 1	1 (20)
GOLD 2	1 (20)
GOLD 3	2 (40)
GOLD 4	1 (20)
CCI, n (%)	
Mild	1 (20)
Moderate	4 (80)
CAT total score	13.0 ± 9.0
CIS20-P Total	78.4 ± 28.9
CIS20-subjetive fatigue, n (%)	
Normal fatigue	1 (20)
Mild fatigue	2 (40)
Severe fatigue	2 (40)
mMRC (median [Q1; Q3])	3.0 [0.5; 3.5]
6MWD, meters	419.0 ± 102.0
6MWD (% predicted)	88 ± 23

Legend: Results are presented as mean ± standard deviation, unless otherwise stated.
6MWD, 6-minute walking distance; BMI, body mass index; CCI, Charlson Comorbidity Index; CAT, COPD Assessment Test; CIS20-P, Checklist of Individual Strength; FEV_1, forced expiratory volume in first second; GOLD, Global Initiative for Obstructive Lung Disease; mMRC, Modified Medical Research Council.

Regarding the experience with new technologies, all patients used smartphones, performing various tasks on them, as using GPS (n=2), taking photos, playing games, and using social media (n=3), sending/receiving text messages (n=4) and browsing the internet and listening to music (n=5).

Feasibility of the study design

The recruitment rate was 83% with 100% retention and no dropouts.

Feasibility of the intervention

During the intervention, no adverse events or unplanned healthcare use were reported. Only one technical issue with the app was reported regarding difficulties connecting to the app – the researcher restarted the app, and the problem was solved. Adherence was 100%, with patients syncing the mobile app daily. The call for goal progression (T2) lasted an average of 10 minutes. The summary of goal progression and diary of telephone calls (to report technical issues from the app, goal setting, and PA promotion) was recorded, and it can be found in supplementary material 2.

Acceptability

The focus group interview lasted 1 hour and 6 minutes, and the following themes were identified:

1) Value of the PA coaching intervention using eHealth and its impact on PA levels - all patients considered this type of intervention an added value, both for themselves to increase their perception of PA and for healthcare professionals to help them monitor patients' PA levels.

P5 - *"I think this is important also for doctors to see our capabilities and solve our problems accordingly… it provides guidance [on PA] to the doctor";* **P2 -***"I think this helps us to have a better idea of our effort and to know if we need to walk more…".*

2) Barriers and facilitators of the use of Fitrockr Hub App to promote PA – The focus only on step counts to define PA goals and lack of personalisation (excluding PA activities other than walking), occasionally step miscounts (through the smartband), and not having the app for free in the real context was considered a barrier. The participants identify as facilitators having a user-friendly layout, adequate time consumption and prescription of PA goals.

P2 - *"This app should have more options than just walking… it is reductive in this way".*

3) Goal setting, progression, PA monitoring and promotion – patients considered the goal setting a collaborative and personalised process, highlighting the importance of negotiated PA goals with their healthcare professionals. Patients considered the adjustment of their PA goals (based on performance and willingness to increase) adequate and emphasised the identification of barriers to PA and strategies to overcome them every week as being beneficial for PA engagement. The main barriers to not reaching the PA goals by patients were bad weather, exacerbations/worsening of symptoms and variability in response to PA. The importance of maintaining contact with healthcare professionals during the intervention, either via video call or telephone, was also highlighted by all patients.

P2 - *"each patient has their own PA goal, and this is important because people have different health conditions, not everyone has de same degree of severity so you cannot set the same goals for everyone;* **P4 -** *"(the revision of PA goals) should be weekly because if there is any correction or adjustment needed, it can be done (right away)"*; **P3 -** "it was great to have a possibility to contact our healthcare professional"; **P2 -** *"in week 2, I have the goal of 8000 steps/day but this coincided with cold weather and I did not have achieve the goal because I was not going leave the house with bad weather…";* **P4 -** "I think is a good option to talk by telephone calls… [in that way,] the colleagues that live far away do not need to come on purpose if they can talk by telephone"; **P2 -** "by videocall is better… the communication is done a lot through gestures, eyes, voice… and you can even get a better sense of whether the person is more or less engaged based on their facial expression".

DISCUSSION

Main findings

Overall, this PA coaching intervention using eHealth appears to be feasible and well-accepted by patients. Patients' feedback about the intervention was positive, as they considered the app easy to use and valuable for PA self-management and remote monitoring by healthcare professionals. Patients underlined the importance of weekly goal adjustments, frequent app notifications, and weekly contact with healthcare professionals through telephone/video calls. However, patients identified some limitations regarding the use of the app, including a lack of personalisation, the exclusive focus on step counts to define PA goals, and occasional step miscounts.

Feasibility of the study design and the intervention

Feasibility studies are carried out previously to large-scale studies to determine whether an intervention can be implemented and, if so, how it should be done [37], testing the intervention for acceptability and testing out design elements of a future RCT. The primary focus was on modifiable factors related to the functioning of the Fitrockr Hub App in a real context and the acceptability of PA coaching intervention using eHealth among patients, to enable its adjustment before being implemented in a larger study, to improve the chances of intervention success. Despite a shorter intervention period compared to similar studies [38, 39], this study achieved higher recruitment and retention rates (i.e., >80%) and adherence to the intervention, demonstrating the feasibility of this study design [15].

The feasibility of the intervention itself was also evaluated, where the procedures to be followed during the intervention were tested, with particular focus in the following situations: technical issues arising from the app (e.g., synchronisation/device pairing failure); consecutive non-achievement of the goals, identification of PA barriers, feasibility of the PA goal setting algorithm and goal progression.

A systematic review identified poor digital literacy and technical challenges as major barriers to the successful implementation of eHealth interventions in COPD management [40]. Considering this, the research team received prior training on potential technical issues to ensure adequate support during the intervention. The only issue encountered was difficulty connecting the app to the smartband, which was resolved by restarting the application.

No barriers were identified regarding PA practice, which may be attributed to the brief intervention period. Over time, factors such as comorbidities, environmental challenges, and psychological barriers (e.g., fear of breathlessness) can become more pronounced, potentially impairing adherence to the intervention [41].

Although participants did not consistently achieve their weekly goals, they reported that the algorithm for goal setting was appropriate, with a period of revision and incremental increases being acceptable. These findings align with previous literature recommending weekly goal adjustments with step-count increases ranging from 5% to 15%, tailored to individual tolerance and adherence levels [42-44].

Acceptability of the intervention

Despite achieving the PA goals, patients demonstrated full adherence to the intervention by synchronising the app every day. Patients were asked about their opinion regarding the different components of the PA coaching intervention using eHealth. Most patients found the PA promotion app easy to use and were able to incorporate it into their daily lives. However, important limitations were identified, including the exclusive use of step-based goals and the lack of app personalisation, which may negatively impact patients’ motivation, sustain engagement with the intervention, or maintain behavioural changes. Although it is not possible to change the eHealth platform used in the present study, as it was already developed and PA coaching may not have been its primary focus, other aspects, such as enhancing app personalisation to better align with patients’ needs, should be considered in future studies.

This intervention was highly valued by patients, as it maintained regular weekly contact between them and healthcare professionals. Considering the importance of patient-professional interaction in the success of PA promotion strategies [45], particularly within digital health interventions [40], this component was identified as a key facilitator for the adoption of the intervention. Consistent with previous findings [46, 47], all participants also highlighted the value of personalised goal setting, tailored to individual needs, and feedback notifications as essential elements of such interventions.

The primary barriers to achieving PA goals reported by patients were consistent with previous literature [48], notably health-related issues such as exacerbations/worsening of symptoms and individual variability in response to PA and environmental conditions (e.g., bad weather). Recognising these barriers and implementing strategies to address them is critical for the development of effective and individualised PA interventions that promote sustained adherence. In the present study, several behavioural strategies — such as goal setting, feedback and monitoring, natural consequences, repetition and substitution, and self-belief — were employed. These evidence-based approaches have demonstrated efficacy in improving PA levels in individuals with COPD [49-51] by enabling patients to identify personal barriers and collaboratively develop strategies to overcome them.

The findings of this feasibility study suggest that the goal-setting algorithm is appropriate for patients with COPD. Weekly contact between healthcare professionals and patients to establish PA goals, identify potential barriers and corresponding strategies to overcome them, and provide feedback on performance emerged as essential components to retain in future larger-scale studies.

Limitations

Although PA coaching using eHealth may represent a promising approach for self-managing COPD, the findings of this study should be interpreted with caution due to the small sample size and the predominance of participants with prior digital literacy. This limits the generalisability of the results, as previous literature has indicated that individuals with greater interest and experience in technology are more likely to benefit from eHealth interventions [52]. Given the short duration of the intervention, significant changes in PA behaviour were not expected. Instead, collecting health-related outcome measures at baseline and the end of the study primarily served to assess the feasibility of data collection procedures and inform refinements for future large-scale trials.

Conclusions

This feasibility study showed that the PA coaching intervention using eHealth is well-structured and well-accepted by the patients. However, some barriers still need to be addressed in future studies to ensure adherence to the intervention. Larger and longer studies are required to assess the impact of the intervention on patients' PA levels and health-related outcomes.

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Ethical approval:

This study was approved by the Ethics Committee of the institution involved, i.e., the Local Health Unit of the Leiria Region, reference 10/2024, minutes 022024/01/16 of Investigation Center of the Local Health Unit of the Leiria Region, Portugal.

Conflict of Interest:

The authors declare no conflicts of interest related to this work.

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