

## **PODCAST JOURNAL CLUB**

*Long et al. Impact of fan therapy during exercise on breathlessness and recovery time in patients with COPD: a pilot randomised controlled crossover trial. ERJ Open Research 2021 7: 00211-2021. DOI: 10.1183/23120541.00211-2021. <https://openres.ersjournals.com/content/7/4/00211-2021>.*

On today's episode, I'm going to discuss an article published in the European Respiratory Journal Open Research in November of 2021. The authors of this article are Alex Long, Martin Cartwright, and Charles Reilly from Kings College Hospital and the University of London in the UK. This is an open access article which means it is freely available – I will put the link in the show notes.

In this paper, the authors address the challenge of reducing breathlessness during exercise for people with COPD. We know that PR (Pulmonary Rehabilitation) improves exercise tolerance, based on many clinical trials and systematic reviews that have reported improvements in exercise capacity, 6MWD (6-Minute Walk Distance), and shuttle walk distance. Yet many patients with COPD find that breathlessness during exercise reduces their capacity and is distressing. Pursed-lip breathing is a long-standing intervention to reduce breathlessness, but for some patients it is only minimally effective, or it is distressing for them to try to alter their breathing. So, patients and clinicians would welcome any additional interventions to reduce dyspnea during exercise.

Previous studies have explored the use of cool air blown onto the face of people to reduce breathlessness while people are at rest. The authors discuss some of the potential mechanisms which may be affected when cool air is blown on one's face, including the stimulation of facial receptors connected to the trigeminal nerve, which in turn alters input to certain sensory processing areas of the brain. In addition, the oral mucosal stimulation that also occurs can alter the perception and intensity of dyspnea. Previous qualitative studies report that patients with COPD note an improvement in their dyspnea when they use a fan to blow air onto their faces. Less is known about how intentional and specific fan therapy during exercise may reduce dyspnea in people with COPD.

Therefore, the authors identified 3 aims: 1) to investigate the effect of fan therapy on exercise-induced breathlessness and post-exercise recovery time in patients with COPD; 2) to investigate the acceptability of fan therapy during exercise; and 3) to assess the reproducibility of any observed improvements in outcome measures.

So, how did they go about addressing these aims? Well, they designed a randomized, controlled cross-over, open trial of fan therapy versus no fan therapy during the 6MWT (6-Minute Walk Test) in people with COPD.

They recruited people with COPD who had exertional breathlessness, which they defined as a modified Medical Research Council score of 2 or more. This means the participants had answered that they walk slower than people of the same age, or have to stop walking due to breathlessness, when walking on level ground. They excluded people who had significant cardiovascular disease, any change in medication (any recent change), a COPD exacerbation causing hospitalization within the last 4 weeks, or an inability to hold a handheld fan. Participants were recruited from COPD outpatient clinics and pulmonary rehabilitation programs.

This study had several phases. The researchers first conducted the trial to assess differences in breathlessness. After recruitment, participants completed their first 6MWT. This occurred before

randomization, and was done to take into account the learning effect that occurs between the first and second six minute walk test. Then, the participants were randomized to either take a 6MWT while holding a handheld fan or not holding a fan. They did that walk test, then they waited 30 minutes, and re-did the 6MWT, but those who didn't hold the fan previously now did the test while holding a fan, and vice versa. This is what a crossover design is. At the end, the participants completed an acceptability questionnaire. It's important to add a questionnaire like this because it's no small thing to ask a patient to conduct an exercise test while also holding a fan up and blowing air in their face – even if it has the potential to reduce their breathlessness. So, patient feedback on the acceptability of the intervention is an important piece of information.

What did the fan intervention look like? They used handheld fans that were battery-operated, with three propeller blades. The participants were instructed to hold the fan to their face throughout the test and during the recovery period.

The next phase of the study was to look at how consistent the measures were. Would the same results be found if the experiment was repeated in a week? To answer this, the researchers repeated the same experimental procedures, including the crossover nature of the experiment and the questionnaire.

The researchers identified several primary and secondary outcomes. The primary outcome they used was a change in breathlessness magnitude, which was measured using a numerical rating scale, which where 0 means not breathless at all, and 10 means the worst possible breathlessness. So, the change score was the post-test breathlessness score minus the pre-test breathlessness score. The secondary outcomes were the actual breathlessness scores, the Borg Dyspnea scale, the 6MWD, and the post-exertional recovery.

Now, what does it mean to run a pilot randomized controlled trial? This term is used a lot, and not always consistently. A pilot trial is conducted as a way to confirm that the methods are appropriate, the experiment can be conducted properly, the outcomes measures can be used accurately, and also to get some idea of the effect the experiment has on the outcome measures. This information is very helpful when you are planning the larger study – you want to make sure you can conduct a small study before you embark on a larger, expensive trial. Pilot studies typically have small sample sizes, and aren't really designed to determine the final answer, and definitively state if an intervention is beneficial and should be adopted into clinical practice. But still you can get an idea of the potential benefit of an intervention from a pilot study. But you take it with a grain of salt.

So, let's look at their results.

The researchers had data from 14 patients (so, you can see, a very small study) who completed the protocol. These 14 people had characteristics similar to what you would see in your typical pulmonary rehab – they were about 66 years old, with 48 pack years of smoking, moderate dyspnea and moderate-to-severe COPD. Their COPD Assessment Test was 21 out of a potential score of 40, which indicates medium to high impact of their COPD on their lives.

The first question was: did the use of the fan impact their breathlessness? Yes, for this small sample, the use of the fan resulted in smaller increases in breathlessness during the walk test. So, you'd expect to see some breathlessness but when they used the fan that increase in breathlessness was less.

Additional questions were related to distance walked, recovery time, and vital signs. Using the fan resulted in a greater distance walked and a shorter breathlessness recovery time. There were no differences in HR, SpO2 or number of stops taken during the walk test.

The second part of the study asked: were these findings consistent? And yes, it appeared that the findings in the second experimental phase, repeated a week after the first, were similar.

The researchers also asked if holding the fan during the test was feasible to the participants. The participants reported that using the fan was acceptable to them, and it was no additional burden to carry the fan during the test. So, overall, there was a very positive outcome for the study.

The researchers report on a number of strengths for this study, including conducting the initial 6MWT prior to the fan experiment, to reduce the impact of the learning effect. They did note, however, that completing 3 6MWT in one day may fatigue patients.

The researchers acknowledge a few limitations of this study. First, a reminder that this is a pilot study, not a definitive study, so basing clinical decisions on a sample of 14 people would not be appropriate. They were only able to recruit 54% of eligible patients, so this may have been a highly-motivated sample or may have been focused on people who already knew that they experience positive benefits of being near fans. People whose dyspnea gets worse in the presence of forced air or fans may have decided not to participate. They also acknowledge that this was a short term experiment of fan use during a 6 minute walk test. They cannot report on the benefits of fan therapy during an exercise session, or over a longer time period. They also note that they aren't sure when fan therapy would be useful. Is it something that would be incorporated by patients into their day to day lives, or is it more useful or feasible to use it in a targeted way, such as during an exercise session? I also wonder about the bias introduced in the study when the participants were told what benefit the fan therapy could confer. Knowing that the therapy was meant to reduce breathlessness may have led patients to report a lower level. Sometimes studies get around this problem by telling patients they are interested in other outcomes. In this case they could have said they were interested in knowing the benefit of fan therapy on perceived temperature or heart rate, so that participants would not be overly focused on their breathing and the idea that the fan would reduce it.

So, can you use this in your rehab practice? I would say that we should not change the clinical practice guidelines regarding conducting a six-minute walk test, and start having our patients carrying fans. But, if you do this, it's important that you make sure that your pre-rehab test and your post-rehab test are conducted under the same conditions, which mean you use the fan in the same way both times. What about during the exercise sessions? Well, if you're like a lot of programs, you might already have a fan blowing if you have problems with ventilation or if it's too hot. If patients like a fan blowing on their face while they are exercising, I don't think it will hurt! But I would caution about having patients walking around with fans – that might be just too many things for them to contend with.

This study has provided the researchers with information on conducting a larger trial with more people. I hope they would also expand the experiment to look at fan therapy during rehab, not just during a walk test. But you can further understand how much breathlessness can limit the exercise performance of patients with COPD, and I think it is great if we can continue to find low-cost ways to increase the physical capacity of our rehab patients.

