Can bronchodilators improve physical activity in COPD patients?

Chronic obstructive pulmonary disease (COPD) is a condition that affects the lives of millions of people around the world. It is also the third leading cause of death worldwide, responsible for approximately 6% of all deaths. Bronchodilators are a category of medications that help control COPD symptoms and have also shown promising results in increasing patient physical activity. Professor Yoshiaki Minakata and his team at Wakayama Hospital in Japan have been working on a means of accurately evaluating the effects of bronchodilators on patient physical activity levels.

Chronic obstructive pulmonary disease (COPD) is a long-term disease of the respiratory system that is characterised by airflow limitation caused by damage to the lung tissues. The most common symptoms are shortness of breath, muscle fatigue and coughing. These can worsen after different levels of physical exercise, depending on the severity of the condition. In some cases, symptoms can significantly restrict everyday activities. This can lead patients to opt for a more inactive lifestyle which in turn causes further deterioration of their physical condition and overall health. Thus, increasing activity levels is vital for improving the health of patients with COPD, especially since the level of physical activity has been shown to be the most significant risk factor for mortality in COPD patients.

A number of recent studies suggest that bronchodilators, a category of medications that are commonly used in the form of inhalers for controlling COPD symptoms, are potentially also helpful for increasing patients' physical activity levels. However, evaluating the benefit from their use can be a challenge. Accelerometers are devices often used to estimate the changes in physical performance after the patients are given bronchodilators, but so far studies have reported mixed outcomes, especially the ones that failed to fine-tune specific fluctuating factors that affected the end result.

The above challenge of clarifying the role of bronchodilators in improving physical activity has been taken on by Professor Yoshiaki Minakata and his team at Wakayama Hospital in Japan. The group have been studying the relationship between the adjustment of influencing parameters and the actual efficacy of bronchodilators on improving the physical activity of patients with COPD.

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IDENTIFYING INDICATORS AND FACTORS

Minakata and his team decided to review and analyse the reports of fifteen studies that had evaluated the effects of bronchodilators on COPD patients' physical activity by looking at the indicators of physical activity provided by accelerometers. Accelerometers are electromechanical devices that measure the duration of an activity, the number of steps taken by the patient and in some cases, depending on the type of the device, the intensity of the activity. The team made a list with the indicators of physical activity used in the studies as well as all the factors reported to be influencing the reproducibility of the results.

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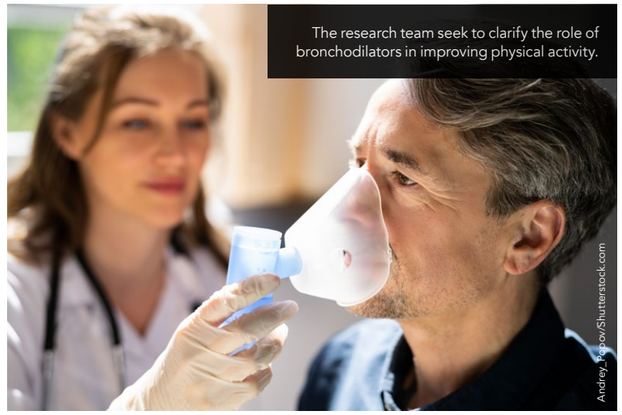

The research team seek to clarify the role of bronchodilators in improving physical activity.

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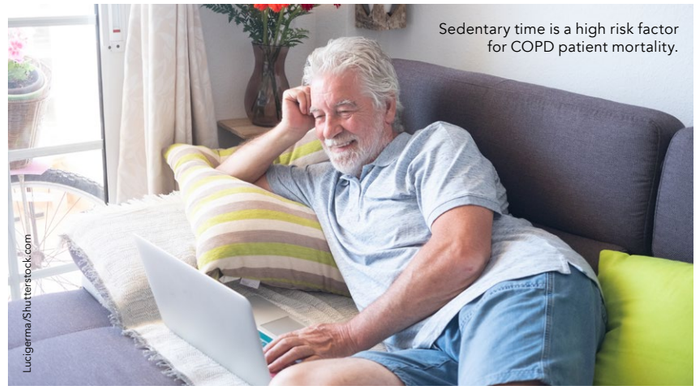

Sedentary time is a high risk factor for COPD patient mortality.

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The indicators used in the studies included the intensity of the exercise expressed in METs (ratio of the working metabolic rate to the standard resting metabolic rate). Depending on its intensity, the activity was classified as light physical activity or LPA (1.5 MET to <3 MET), moderate physical activity or MPA (3 MET to <6 MET) and vigorous intensity activity or VPA (6 MET or more). A common factor used in the studies was MVPA, which stands for moderate to vigorous physical activity and includes walking at normal speed. Other factors included the duration of the activities, the total energy spent, the step count and the sedentary behaviour (any waking activity of 1.5 MET or less).

The list of the unbalanced influencing factors included the non-wear time (the time that patients reported to have been active but had not recorded since they had forgotten to attach the accelerometer), days with uncommon activities, environmental factors (the season, weather, etc) and special days/holidays.

FINE-TUNING ALTERS RESULTS

Among the fifteen reports analysed, eight of them demonstrated that

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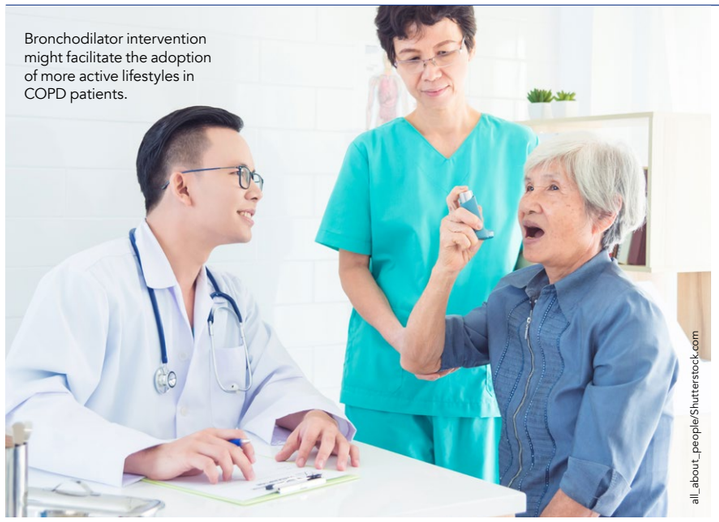
Shortness of breath, muscle fatigue and coughing can be exacerbated after exercise in COPD patients.

A number of recent studies suggest that bronchodilators are potentially helpful for increasing patients' physical activity levels.



Bronchodilator intervention might facilitate the adoption of more active lifestyles in COPD patients.

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bronchodilators were beneficial for improving physical activity of COPD patients, while four studies showed that bronchodilator efficacy depended on the indicator used every time and three studies suggested that bronchodilators did not improve patient physical activity at all.

The analysis of the data revealed that five out of the eight studies that reported positive results after pharmacological treatment with bronchodilators included adjustment of at least two out of four influencing factors (non-wear time, days of special behaviour, environmental factors, number of valid days required). A similar fine-tuning was performed for two out of the three studies that reported that the benefit of the medication depended on specific indicators, and no fine-tuning was performed for the four studies that suggested bronchodilators were ineffective. All reports in which adjustment of influencing factors was performed showed some beneficial effects of bronchodilators on patient physical activity level. This outcome could mean that refining influencing factors data in order to achieve result reproducibility could be necessary in order to evaluate the actual results of bronchodilators usage and efficacy.

IS SEDENTARY TIME AN INDICATOR?

Sedentary time is the amount of time the patient has been engaging in sedentary behaviour. A sedentary lifestyle has been shown to affect the human body through various mechanisms and can lead to increased cancer risk and metabolic diseases, such as diabetes mellitus and hypertension. Sedentary time is a risk factor that affects the body independently from physical activity and, specifically for COPD patients, it has been shown that sedentary time of 8.5 hours or more daily is associated with far higher mortality rates. Unfortunately, there were only two out of the fifteen studies that reported on patients' sedentary time. Both of them demonstrated some promising results, especially since the treatment with bronchodilators significantly reduced sedentary time for the patients.

A sedentary lifestyle has been shown to affect the human body through various mechanisms and can lead to higher mortality rates in COPD patients.

ADJUSTMENT COULD BE NECESSARY

Although bronchodilators are known to improve pulmonary function and control disease flare-ups in patients with COPD, their effect on physical activity still remains unclear. The controversial results reported in the review's analysed studies could be related to parameters that can directly influence physical activity, for example the psychological status of the patient at the time, but also to factors that could influence the reproducibility of the acquired data.

The team's analysis showed that most of the investigated studies that reported on bronchodilators improving the levels of physical activity in COPD patients had at least two out of the four influencing factors (non-wear time, special days, environmental factors and number of days required) processed in order to achieve reproducibility of their outcomes. These results led Minakata's team to the conclusion that the processing of the factors that was performed by the individual researchers of the studies in order to make their results reproducible could actually be affecting the end results in regards to whether the bronchodilators actually worked or not. The data analysis also suggested that early intervention with bronchodilators might lead to a further increase of physical activity levels and that these patients might eventually be able to adopt a more active lifestyle compared to the ones that received intervention later on.

In conclusion, although the effect of bronchodilators on physical activity in patients with COPD was controversial, all of the reports that included adjustment for factors influencing the reproducibility of the results demonstrated beneficial or partially beneficial effects. It seems that in order to come to more definite conclusions on the efficacy of bronchodilators in regards to improvement of COPD patients' physical activity, there have to be further studies, the design of which will take into account the reproducibility of the results and focus more on the adjustment of the unbalanced factors. Last but not least, the effects of the treatment with bronchodilators on sedentary time, an independent risk factor for COPD patient morbidity and mortality, underlines the importance of focusing on the role of this overlooked parameter in future studies.

Behind the Research

Professor Yoshiaki Minakata

E: minakata.yoshiaki.qy@mail.hop.go.jp **T:** +81 738 22 3256

Research Objectives

Professor Yoshiaki Minakata assesses whether bronchodilators can improve physical activity in COPD patients.

Detail

Address
1138 Wada, Mihama-cho, Hidaka-gun, Wakayama, 644-0044, Japan

Bio
Minakata graduated from Wakayama Medical University, Wakayama, Japan, in 1986. From 1997 to 2014 he was Assistant Teacher, Assistant Professor, then Associate Professor at Wakayama Medical University. Since 2014 he has been Director of Hospital at National Hospital Organization, Wakayama Hospital.

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Personal Response

What are the parameters that would have to be included or excluded in a future study in order to achieve the ideal level of reproducibility and consistency?

"To evaluate the effect of some intervention, investigators should exclude the data of the days with less than 8 or 10 hours of wear time, with rain, and with special activities. Furthermore, investigators should analyse the data except for cases with valid days of less than 3 or 5 days."

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