

## DESIGNING A WEBSITE-BASED APPLICATION "RIRI'S PRANAYAMA BREATHING EXERCISE" TO REDUCE DYSPNEA IN COPD PATIENTS

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### Abstract

Background : Patients with COPD can perform breathing exercises, such as pranayama breathing exercises, to help reduce dyspnea. The website application "Riri's Pranayama Breathing Exercise" will assist COPD patients in performing breathing exercises independently through the website. This application is equipped with a guide to pranayama breathing exercises. Objective : The purpose of this research is to design a website application to help reduce dyspnea in COPD patients. Method : The research design uses the Research and Development (R&D) method with the ADDIE model approach (Analysis, Design, Development, Implementation, Evaluation). The validity test was conducted by 2 experts (content and application experts) using a questionnaire for assessment, and an interrater reliability test was performed. Additionally, a validity test was conducted with 5 respondents using an application assessment questionnaire. Results : The results of the model validation calculation showed an average percentage (Content relevance and Program feasibility) of 92%, indicating that the application is very feasible. The interrater reliability test between Expert 1 and Expert 2 yielded a Kappa coefficient of  $1.00 > 0.80$ , meaning the agreement was very perfect, with a p-value of  $0.014 < \alpha = 0.05$ , indicating no difference between Expert 1 and Expert 2 in the application development. The results from the limited- scale model application calculation showed an average score of 88%, or very feasible. The validation of the application model across all dimensions showed that the average percentage of all components was 88%, meaning that the components of the application model, according to the questionnaire analysis conducted by the respondents on each dimension, were categorized as "Very Feasible". Conclusions : The conclusion of the study is that the application is valid and reliable for use. The next development of the Riri's Pranayama application, initially based on a website, will move to an Android or iOS version for easier access by all COPD patients and will include additional types of breathing exercise.

**Keyword:** Breathing Exercise 1; CPOD 2; Pranayama 3.

### INTRODUCTION

Chronic Obstructive Pulmonary Disease (COPD) is a common chronic disease characterized by persistent respiratory symptoms and airflow limitation. COPD is a lung disorder marked by impaired lung function, including prolonged expiratory periods caused by airway narrowing, with little change over time during observation. COPD is a heterogeneous lung condition characterized by chronic respiratory symptoms (dyspnea, cough, sputum production, and exacerbations) due to abnormalities in the airways (bronchitis, bronchiolitis) or alveoli (emphysema), leading to persistent and often progressive airflow obstruction. COPD causes airflow obstruction in the respiratory or pulmonary airways (Ramadhani et al., 2022).

According to the World Health Organization (WHO) in 2023, there are 392 million cases of COPD globally, with 3.23 million resulting in death and 74.4 million leading to disability. The WHO predicts that by 2030, COPD will become the third leading cause of death worldwide. According to the Global Initiative for Chronic Obstructive Lung Disease (GOLD), the global prevalence of COPD is 10.3%, and it will continue to rise each year (GOLD, 2023). The Asia Pacific COPD Round Table Group estimates that the number of moderate to severe COPD patients in Asia Pacific countries reaches 56.6 million, with a prevalence of 6.3%. The prevalence ranges from 3.5% to 6.7%, with China having 38.16 million cases, Japan 5.014 million, and Vietnam 2.068 million. In Indonesia, it is estimated that there are 4.8 million people with a prevalence of 5.6%. Based on data from the Pekanbaru Health Office in 2023, there are 2,822 cases of COPD, with the highest number reported at Harapan Raya Health Center, which has 982 cases of COPD.

COPD is a disease caused by smoking habits, air pollution, and infections. The signs and symptoms of COPD include shortness of breath that worsens with physical activity or as one ages, along with a persistent cough with sputum or a history of shortness of breath and coughing with sputum. Air pollution, both indoor and outdoor, such as cigarette smoke, stove smoke, road dust, toxic gases, and motor vehicles, are risk factors for COPD, especially among workers in the informal sector. Both active and passive smokers are at higher risk of developing COPD (Astriani et al., 2021).

In COPD, there is also a decrease in oxygen saturation due to bronchial narrowing, which traps carbon dioxide and prevents oxygen from entering the lungs. Oxygen saturation is the percentage of oxygen in the arteries bound to hemoglobin. The normal oxygen saturation level, measured using pulse oximetry, ranges from 95-100%. A lack of oxygen in the body is indicated by low oxygen saturation, which is below normal (<95%). In patients with Chronic Obstructive Pulmonary Disease (COPD), oxygen saturation decreases due to bronchial narrowing, trapping carbon dioxide and preventing oxygen from entering the lungs. Oxygen saturation in COPD patients can drop to as low as 85%. The safe oxygen levels for moderate to severe COPD patients range from 88-92%. A drop in oxygen saturation in COPD is called hypoxemia. Hypoxemia is the main cause of shortness of breath in COPD patients (Rusminah et al., 2021).

Management of COPD patients includes both pharmacological and non-pharmacological therapies to prevent complications. Pharmacological therapy involves the use of medications prescribed by a doctor. The goal of therapy is to reduce symptoms, decrease the frequency and severity of exacerbations, improve exercise tolerance, and enhance the patient's overall health status. Information about medications to continue at home, such as the correct use of medications, types of drugs, proper administration methods, timing, dosages, and potential side effects, is essential. Incomplete or inaccurate information about medications can lead to non-compliance, reducing the effectiveness of treatment. Pharmacological therapy for COPD patients may have several negative impacts, including side effects from the medications used. For example, the use of bronchodilators and inhaled corticosteroids can cause increased heart rate, sleep disturbances, and a higher risk of respiratory infections. Additionally, long-term use of these medications can lead to dependence and a decline in lung function if not accompanied by non-pharmacological therapy. Psychological effects such as anxiety and depression are also common responses to chronic conditions and prolonged treatment, affecting the patient's overall quality of life (Bararah & Halimuddin, 2021).

Non-pharmacological therapy, one effective method for improving lung capacity and reducing symptoms of dyspnea, is pranayama breathing techniques. Pranayama comes from the words “Prana,” meaning breath, and “Yama,” meaning control. Pranayama is a breathing technique from yoga that focuses on breath regulation and increasing body awareness. Through pranayama practice, patients can learn better breathing techniques, which can help improve oxygen saturation and reduce shortness of breath. Pranayama helps regulate and improve breathing patterns, enhance oxygenation, and reduce dyspnea. By shifting from shallow and rapid breathing, pranayama transforms it into deep and slow breathing. Pranayama is a part of the Astanga Yoga teachings that is still widely practiced today (Lestari & Saraswati, 2022). According to Hidayat (2022), yoga pranayama offers numerous benefits for patients with Chronic Obstructive Pulmonary Disease (COPD). Some of the benefits of pranayama for COPD include improving lung capacity, enhancing oxygenation, improving respiratory function, boosting emotional balance, reducing stress and anxiety, improving sleep quality, enhancing the immune system, increasing body awareness, and promoting a healthy lifestyle.

The web-based application Riri’s Pranayama is designed to assist COPD patients in performing breathing exercises independently. It features a customizable timer that patients can adjust according to their preferences, supporting them in engaging with non-pharmacological treatment. This application also provides educational content about Chronic Obstructive Pulmonary Disease (COPD) and detailed instructions on how to perform pranayama breathing exercises. The design of the app focuses on ease of use and accessibility, ensuring that it can be used by a wide range of people, including those without a healthcare background. By utilizing web technology, the app aims to reach more users across various locations, particularly in areas where healthcare services are limited. Furthermore, the interactive features within the app are intended to boost user motivation, encouraging them to practice consistently.

## RESEARCH METHOD

The development of the web-based application *Riri’s Pranayama Breathing Exercise* employs the Research and Development (R&D) method and the ADDIE approach (Analysis, Design, Development, Implementation, Evaluation). The R&D method is used to identify the need for effective digital literacy as a learning medium and to develop a product that meets both functional and non-functional requirements. Meanwhile, the ADDIE approach is applied in a structured manner through the steps of analysis, design, development, implementation, and evaluation to ensure that the developed application meets user goals and needs, as well as being adaptable for improvement based on user feedback and evaluation results.

## RESEARCH RESULTS

The results from the evaluation of the *Riri’s Pranayama Breathing Exercise* application model showed an average score of 92% across all assessment components (content suitability and program feasibility), indicating that the application is highly feasible. The validation of the application model by experts across all dimensions revealed an average percentage of 92%, meaning that all components of the application model, according to the analysis of the questionnaires conducted by experts in each dimension, fall under the "Highly Feasible" category.

**Table 1. Calculation of the Riri's Pranayama Breathing Exercise Application Model (Expert 1)**

No.	Assesment Criteria	Mean	Feasbility Percentage	Criteria
1.	Flexibility	3	75%	Worthy
2.	Accuracy and trurhfulnes data	4	100%	Very Worthy
3.	Content Completness	3	75%	Worthy
4.	Format Display	4	100%	Very Worthy
5.	Timelines Of Use	4	100%	Very Worthy
6.	Contribution and trend	4	100%	Very Worthy

Source: Primary Data

**Tabel 2. Calculation of the Riri's Pranayama Breathing Exercise Application Model (Expert 2)**

No.	Assesment Criteria	Mean	Feasbility Percentage	Criteria
1.	Flexibility	3	75%	Worthy
2.	Accuracy and trurhfulnes data	4	100%	Very Worthy
3.	Content Completness	3	75%	Worthy
4.	Format Display	4	100%	Very Worthy
5.	Timelines Of Use	4	100%	Very Worthy
6.	Contribution and trend	4	100%	Very Worthy

Source: Primary Data

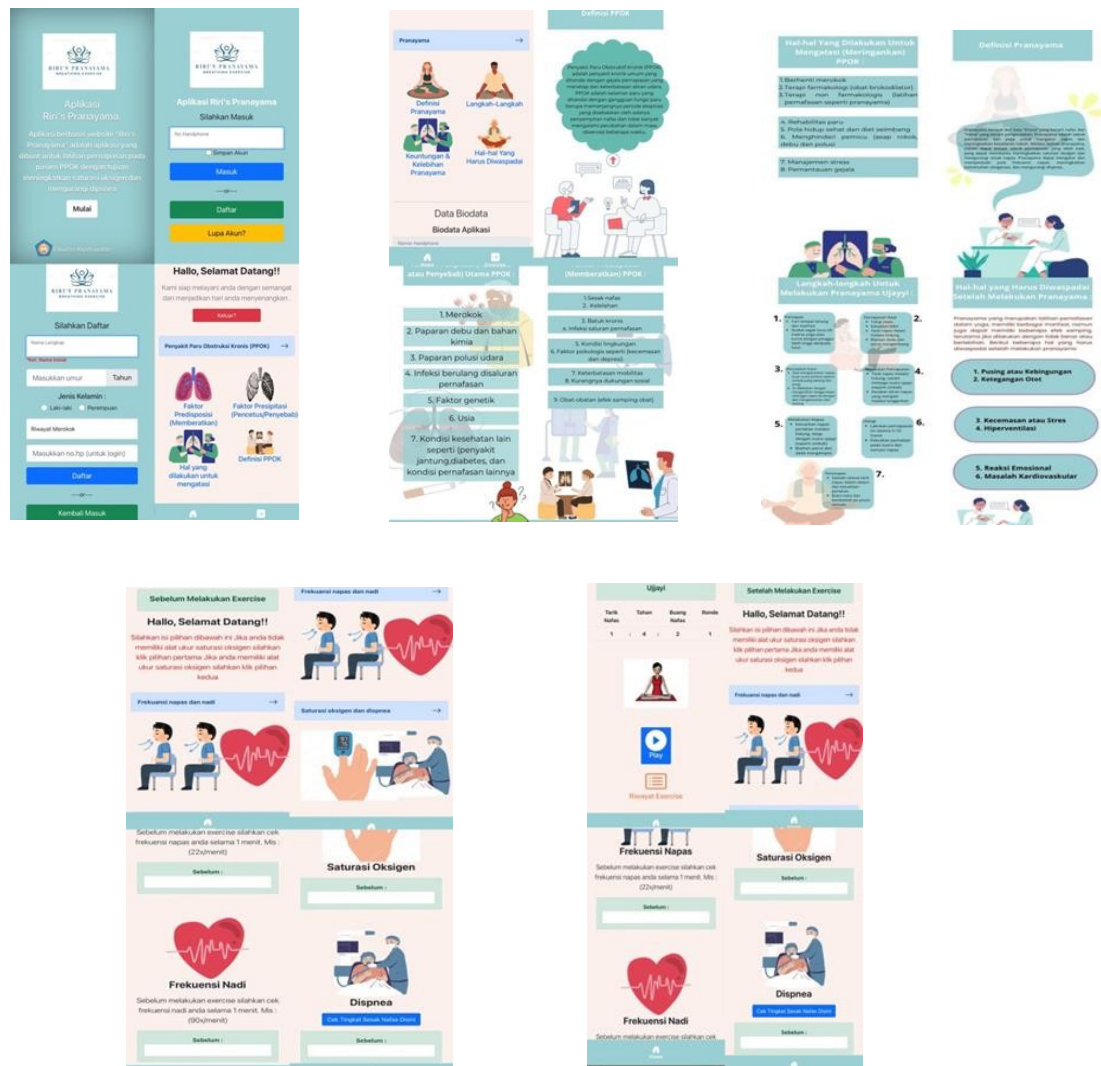
**Table 3 Kappa Analysis**

Expert	Assesment	Kappa Coeficient	P Value
Expert 1 & Expert 2	6	1.00	0,014

Source: Primary Data

In the table showing the results of the interrater reliability test between Expert 1 and Expert 2, the Kappa coefficient is  $1.00 > 0.80$ , which means that there is perfect agreement between Expert 1 and Expert 2. Additionally, the p-value is  $0.014 < \alpha 0.05$ , which indicates that there is no significant difference between the evaluations of Expert 1 and Expert 2 regarding the application development. This suggests that both experts have similar assessments and agree on the development of the application.

**Picture 1-5. The picture below is the display of the application “Riri’s Pranayama Breathing Exercise.”**



## DISCUSSION

Based on the results of the validation test for the Riri Pranayama web model, it was found that there is alignment between the content and the program feasibility model, which was developed based on the needs analysis process and application design. The results from the expert validation analysis by Expert 1 and Expert 2 showed an average feasibility percentage of 92%, indicating that there is no difference between Expert 1 and Expert 2 in the development of the application. Therefore, the Riri’s Pranayama web application is considered "Highly Feasible" for use. This research is in line with the study by M. Zul'irfan et al. (2024) on the design of the VIBE web application for asthma control. However, the key difference in this study is that the web application designed by the author aims to assist COPD patients by providing easy access to pranayama breathing exercise guides.



The evaluation results at the model validation stage also show that the experts provided recommendations and feedback regarding the development of the application. They suggested improving the completeness of the content in the program and recommended adding methods for usage on Android or iOS platforms to make the application more accessible to users. Overall, the design of this application has successfully created an innovative tool that can help COPD patients reduce dyspnea through pranayama breathing exercises. Additionally, pranayama breathing exercises also serve to improve oxygen saturation in COPD patients (Rusminah et al., 2021). The application design process, including analysis, design, development, implementation, and evaluation, has shown through expert testing results that the application is highly feasible for use by COPD patients in performing pranayama breathing exercises regularly.

The results from the limited-scale test conducted with 5 COPD patients using a questionnaire assessment showed an average score of 88%, indicating that the Riri Pranayama web application is "Highly Feasible" for use. The web application was found to be very helpful in reducing shortness of breath, easy to understand, with clear guidance, and an intuitive interface. The pranayama breathing exercise application for COPD patients, supported in a web format, greatly assists patients in reducing dyspnea. This is because the application can be accessed anytime and anywhere, especially for regularly controlling shortness of breath.

COPD patients experience persistent breathing difficulties and airflow limitations due to airway obstruction or abnormalities caused by harmful particles or gases. Therefore, pranayama yoga therapy is an effective approach to provide positive improvements in lung function and exercise capacity. It has the potential to become an additional pulmonary rehabilitation program for patients with COPD (Lutfian, 2021).

There are several breathing techniques that can be used for COPD patients. These techniques not only help reduce dyspnea, but they can also improve sputum clearance, quality of life, lung capacity, and reduce anxiety. However, this review cannot recommend which technique is superior, as each study used different measurement tools and exercise durations. Controlled Breathing exercises are similar to Active Cycle of Breathing Techniques (ACBT), which combine several exercises (Rahmi et al., 2023).

Based on the research conducted, the design of the "Riri's Pranayama Breathing Exercise" web-based application has proven to be effective in helping reduce dyspnea in COPD patients. This application is designed with features that make it easy for users to perform pranayama

## **CONCLUSION**

Based on the results of the validation test of the Riri's Pranayama application model, the content alignment and program feasibility were found to be in accordance, with a percentage of 92% based on evaluations from two experts. The interrater reliability test results between Expert 1 and Expert 2 indicate that there is no difference in their assessments regarding the development of the application. Furthermore, the results from the limited-scale test involving 5 COPD patients showed an average score of 88%, indicating that the Riri Pranayama web application is highly feasible for use. The web application is very helpful in reducing shortness of breath and is easy to understand.

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