Health-related Serious Games on the Rehabilitation for Patients with COPD: Systematic Review Protocol

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Review question / Objective: The aim of this systematic review is to identify effectiveness and patients' demand on serious games for COPD patients as well as to recognize potential research gaps in this area by synthesizing and appraising studies examining effects of serious games on COPD patients.

Eligibility criteria: OutcomesThe outcomes that include health-related endpoints such as pulmonary function, exercise capacity, dyspnea, compliance, or adverse effects, will be enrolled. Further inclusion criteriaStudies must be peer-reviewed and be in English or Chinese. Exclusion criteriaStudies will be excluded for the following reasons: (1) duplicate records; (2) studies focused on measurement; diagnostic methods, serious game theory or game development; and (3) conference abstracts or studies that cannot find out full texts.

INPLASY registration number: This protocol was registered with the International Platform of Registered Systematic Review and Meta-Analysis Protocols (INPLASY) on 15 December 2022 and was last updated on 15 December 2022 (registration number INPLASY2022120062).

INTRODUCTION

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Rationale: COPD is a leading disease and causes a significant burden worldwide. Currently, pulmonary rehabilitation (PR) has...
been widely recommended as an effective intervention measure to improve COPD patients’ physical and psychological conditions. However, traditional PR characterized the complexity and availability remains underutilized with low compliance globally. For resolving this trait, nowadays, there is an increasing trend in employing serious games on the rehabilitation of patients living with COPD, but there is no systematic review to comprehensively summarize this topic.

**Condition being studied:** Chronic obstructive pulmonary disease (COPD) is a progressive, preventable and therapeutic disease characterized by several symptoms (e.g., dyspnea, chronic cough or sputum production, etc.) possibly accompanied by fatigue, depression, malnutrition, sleep disturbances, and limitations on daily living[1]. It is claimed that patients with COPD are primarily associated with a history of smoking, occupational exposures, environmental exposures, or an individual or family history of chronic lung disease. In recent years, COPD has been one of the most severe public health challenges for the general population around the world. As of 2015, the total number of patients living with COPD worldwide reached approximately 175 million. The global prevalence was estimated to be around 10.3% of the population, with the phenomenon that men’s was higher than that of women (15.7% and 9.93%, respectively). In the UK, there are approximately 3 million people living with COPD[6]. By contrast, the COPD situation in China is more severe. According to a national cross-sectional study, the overall prevalence of China in people aged over 40 years was 13.7%, and there were almost 99 million patients living with COPD in China. Furthermore, COPD has become the third leading cause of global deaths, causing a heavy burden in global health care. According to estimated data, COPD may kill almost 30,000 patients in the United Kingdom annually. Of those, the figure of COPD deaths in China might be up to around 910,000 annually, accounting for roughly one-third of global COPD deaths. It is predicted by the GOLD report in 2022 that the prevalence of COPD tends to rise in the next four decades and there may be over 5.4 million deaths per year due to COPD and related diseases by 2060[1]. Generally, it seems that people living with COPD are less active compared with people without COPD as the disease progresses[10, 11]. As a result, inactivity in patients with COPD generally will lead to worse health-related results, including lowering the quality of life or increasing the risk of exacerbations. Given the adverse outcomes of inactivity, multiple related guidelines issued in different countries or institutions firmly recommended COPD patients to perform pulmonary rehabilitation (PR) as an effective measure to improve their physical outcomes. Pulmonary rehabilitation usually refers to a tailored intervention after experiencing a comprehensive assessment, consisting of at least physical training, disease-related education with the aim at promoting COPD patients' rehabilitation in physical and psychological conditions. And conventional PR is set and performed at hospitals by doctors, therapists, nurses or other professionals, who deliver management details. However, after discharge for COPD patients without teaching and supervising, it actually remains underused globally due to the complexity and availability of conducting PR, with the data confirming that below 5% of eligible patients ever carried out this program and less than 63% of patients with COPD who commenced PR finished the program. For resolving the strait, there has been some studies in regard to COPD focused on digital technology interventions. As a result, one of the promising emergence is serious game, which is to use the game design elements into the nongame areas, and the game features usually comprises rewards for goal attainment, leader boards on social or peer pressure, integral, and the feedback on performance. Currently, several studies have demonstrated serious game can improve patients' participations and outcomes. Furthermore, the combination with serious game and COPD treatment has been existed and played a
potentially effective value, but there is no systematic review to comprehensively summarize this topic.

**METHODS**

**Search strategy:** For this review, subject headings and keywords were both applied to summarize the potential search terms in each part of the “PICO” framework. Moreover, the search strategy except the “C” part and “O” part only combined the “P” part and “I” part with study design to obtain more comprehensive results. The search strategies separately ran in seven electronic databases, including PubMed, Scopus, Embase (via Ovid), Cochrane library, CINAHL, Science Direct database, and China Biology Medicine disc (CBM). Besides, the search was initially undertaken in PubMed and then tailored and applied the search strategies in the other six databases. The search strategy for PubMed is placed. In addition, manual searches will also be employed to identify additional relevant studies not obtained by the initial search strategy.

**Participant or population:** The participants in these studies, which had been clinically diagnosed with COPD without limitations of age, gender, and ethnicity, will be included.

**Intervention:** Studies, which have utilized rehabilitation training or health education using digital games elements, or game-related interviews such as the Wii Fit system, and interactive games will be considered for inclusion.

**Comparator:** Studies with or without a control group will also be considered.

**Study designs to be included:** Systematic review methods without using meta-analysis.

**Eligibility criteria:** Studies will be excluded for the following reasons: (1) duplicate records; (2) studies focused on measurement; diagnostic methods, serious game theory or game development; and (3) conference abstracts or studies that cannot find out full texts.

**Information sources:** The search strategies separately ran in seven electronic databases, including PubMed, Scopus, Embase (via Ovid), Cochrane library, CINAHL, Science Direct database, and China Biology Medicine disc (CBM). In addition, manual searches will also be employed to identify additional relevant studies not obtained by the initial search strategy.

**Main outcome(s):** The relationship between serious game interventions and patient outcomes (e.g., pulmonary function, exercise capacity, dyspnoea, psychological status, adverse effect) is the main outcome.

**Quality assessment / Risk of bias analysis:** The selection of tools for quality assessment will be determined based on the design of the study. Therefore, this review will employ the Cochrane collaboration RCT quality assessment tool to assess randomized controlled trials; CASP qualitative study checklist will be used to evaluate qualitative study; and JBI quasi-randomized controlled trial assessment tool will be applied to assess the risk of bias and methodological quality of pre-post studies. Besides, two authors will independently evaluate included studies. Similarly, if any discrepancy occurs, a third author will be consulted to make a final decision.

**Strategy of data synthesis:** The results will be presented using descriptive analysis in this systematic review given the possibly significant clinic heterogeneity of the included studies regarding types of studies, serious game protocol characteristics and duration, the study comparisons, and varied outcomes.
Subgroup analysis: Two themes of findings are expected to be summarized, which will separately be relationship between serious game interventions and patient outcomes (e.g., pulmonary function, exercise capacity, dyspnoea, psychological status, adverse effect), and COPD patients’ preferences and needs on serious game interventions.

Sensitivity analysis: There will be no sensitivity analysis in this review.

Country(ies) involved: China and United Kingdom (1. the Affiliated Hospital of Southwest Medical University, People’s Republic of China. 2. Manchester Metropolitan University, the United Kingdom. 3. Southwest Medical University, People’s Republic of China.)

Keywords: COPD; serious game; pulmonary rehabilitation; systematic review; protocol.

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