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Feasibility of Mobile-App Based Pulmonary Rehabilitation in Textile-Dyeing Workers

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	Background		Results
•	Workers in the textile-dyeing industry are frequently exposed to toxic allergens, irritants and high humidity, leading to pulmonary damage.	•	A total of 45 workers in a dyeing industrial complex participated in a pulmonary rehabilitation program using Breathe-On [®] .
•	To reduce the prevalence and severity of occupational respiratory diseases including COPD and asthma, early health monitoring and targeted interventions are crucial.	•	After four weeks of pulmonary rehabilitation program, statistically significant improvements were observed in

• This study aims to evaluate the feasibility of implementing a mobile app-based pulmonary rehabilitation in textile-dyeing workers.

Methods

- Pulmonary rehabilitation program, delivered via a mobile application integrated a breathing exergame using Breathe-On[®] with flexibility exercises with instructional videos (Figure 1).
- The training session lasted 15 minutes (3 repetitions for each exergame and flexibility exercises), daily, five days a week, for four weeks at home.
- Breathe-On[®] is a breathing training device detects inspiration and exhalation through a mouthpiece equipped with a built-in load cell.
- Exergame consists of "Bricks Breaking" and "Weight Lifting".

- FEV1, MIP, MEP, and activity domain of SGRQ (Figure 2, 3).
- Participant compliance was high at approximately 95%.
- No adverse effects, such as dizziness or headaches, were reported during and post intervention.

Conclusion

- Given the high rate of compliance and effectiveness, Breathe-On[®] could be considered treatment option for pulmonary rehabilitation without adverse events.
- Further research into its application across different respiratory diseases, as well as long-term follow up studies to evaluate the sustained effects will be needed.



- In "*Bricks Breaking*", participants aimed to break virtual bricks by exhaling <u>continuously</u> against the predetermined pressure threshold (15 cmH2O)
- Duration of exhalation increased over weeks (week 1~2: 2 seconds(sec), week 3: 4sec, week 4: 6sec).
- In "Weight Lifting", participants aimed to lift virtual weights by exhaling forcefully over against the predetermined pressure threshold following inhalation.
- Threshold of resistance pressure increased over weeks (week 1~2: 20, week 3: 44, week 4: 68 (cmH2O)).
- Between each trial, participants perform one-minute flexibility exercises following videos on App screen.
- Outcome measurements
 - * pre (T0) and post intervention (T1)
 - Pulmonary function test
 FVC, FEV1, MIP, MEP, PEF
 Physical performance
 6MWT, hand grip strength test
 SGRQ, Borg Scale
 <u>*post intervention (T1)</u>
 Participant satisfaction
 Adverse events
 System usability scale

Figure 2. Boxplot depicting difference of pulmonary function between pre- and post-intervention. * P<0.05, ** P<0.01, *** P<0.001.



Figure 1. Mobile-app based pulmonary rehabilitation using Breathe-On® device and embedded exergame.



Figure 3. Boxplot depicting difference of physical performance (6MWT and hand grip strength test) and SGRQ between pre- and post-intervention. * P<0.05.