

Different cardiorespiratory effects of indoor air pollution intervention with ionization air purifier: Findings from a randomized, double-blind crossover study among school children in Beijing★

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Highlights

- Ionization air purifiers could reduce indoor particulate pollution substantially.
- Ionization air purifiers could bring significant benefits to respiratory system.
- Ionization air purifiers might have negative effect on cardiac autonomic function.
- It should be further investigated the effects of ionization air purifiers on health.

Abstract

Indoor air pollution is associated with numerous adverse health outcomes. Air purifiers are widely used to reduce indoor air pollutants. Ionization air purifiers are becoming increasingly popular for their low power consumption and noise, yet its health effects remain unclear. This randomized, double-blind crossover study is conducted to explore the cardiorespiratory effects of ionization air purification among 44 children in Beijing. Real or sham purification was performed in classrooms for 5 weekdays. Size-fractionated particulate matter (PM), black carbon (BC), ozone (O₃), and negative air ions (NAI) were monitored and cardiorespiratory functions were measured. Mixed-effect models were used to establish associations between exposures and health parameters. Real purification significantly decreased PM and BC, e.g. PM_{0.5}, PM_{2.5}, PM₁₀ and BC were decreased by 48%, 44%, 34% and 50%, respectively. O₃ levels were unchanged, while NAI was increased from 12 cm⁻³ to 12,997 cm⁻³. Real purification was associated with a 4.4% increase in forced exhaled volume in 1 s (FEV₁) and a 14.7% decrease in fractional exhaled nitrogen oxide (FeNO). However, heart rate variability (HRV) was altered negatively. Interaction effects of NAI and PM were observed only on HRV, and alterations in HRV were greater with high NAI. Ionization air purifier could bring substantial respiratory benefits; however, the potential negative effects on HRV need further investigation.

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