AUTHOR CONTRIBUTIONS

AS designed the study and wrote the manuscript. PH performed data collection, interpretation, and journal submission assistance for this manuscript. SM, MH, DY, SH, and AR contributed to the conduct of the study and data collection. All authors read and approved the final manuscript.

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None of the authors have a conflict of interest to disclose.

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SUPPORTING INFORMATION

Additional supporting information can be found online in the Supporting Information section at the end of this article.

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Overall and respiratory mortality reduction with physical activity in subjects with and without asthma

To the Editor,

Despite advances in pharmacological treatment, the worldwide disease burden of asthma is still substantial, and the potential benefits of non-pharmacological treatments are understudied.[1] Among non-pharmacological treatments, enhancing leisure-time physical activity (PA), a cost-effective strategy applicable in daily life, has been shown to improve cardiopulmonary fitness and provide benefits in lung function and asthma control.[1–3] While the long-term benefit of PA has been well demonstrated in the general population, it is not clear whether PA can improve long-term outcomes, such as mortality in asthmatic patients.[4] Thus, we aimed to evaluate the impact of PA on overall and respiratory mortality in subjects with and without asthma using Health Screening Examination (HSE) data from the Korean National Health Insurance Service-National Sample

Cohort, comprising a representative sample of 2.2% of Korean citizens (n = 1,012,637).[5] This study was approved by the institutional review board ethical committee (no. HYUH-2021-10-017).

This study consisted of 18,994 subjects with asthma defined using the International Classification of Diseases 10th Revision (ICD-10) codes for asthma (J45-J46) and asthma-related medication (asthma group) within 1 year before HSE[6] and 521,536 subjects without asthma (control group) between January 2009 and December 2017 (Figure S1). All participants were followed until death or 31 December 2017. The main exposure was the amount of leisure-time PA during free time (excluding PA during employment or usual daily life), and outcomes were overall and respiratory mortality; see footnotes of Tables S1 and S2 for the estimation of the amount of PA and definition of levels of PA, respectively. Respiratory mortality was defined as death recorded using the ICD-10 codes for respiratory diseases (J00-J99).

About two-thirds were above 40 years of age, 51% were female, and 55% were overweight or obese. Approximately 62% were never-smokers. Asthma was associated with older age, female sex, obesity, never-smoker status, lower income, lower PA level and multiple comorbidities ($p < 0.01$ for all; Table S1). Across all levels of PA, the overall and respiratory mortality rates (/1000 PY) were significantly higher in the asthma group than in the control group ($p < 0.01$ for all PA groups; see Table S2), and there was an inverse relationship between PA and both overall and respiratory mortality, in both asthma and control groups (Figure 1A and B, respectively). As shown in Figure 2, the sedentary asthma group had significantly higher overall and respiratory mortality relative to the control group with PA≥1500 METs-min/week (adjusted hazards ratio [aHR] [95% confidence interval {CI}], 2.24 [1.99–2.52] for overall mortality; 5.29 [3.90–7.18] for respiratory mortality). When PA was evaluated as a continuous variable, a 500 METs-min/week increase in PA was

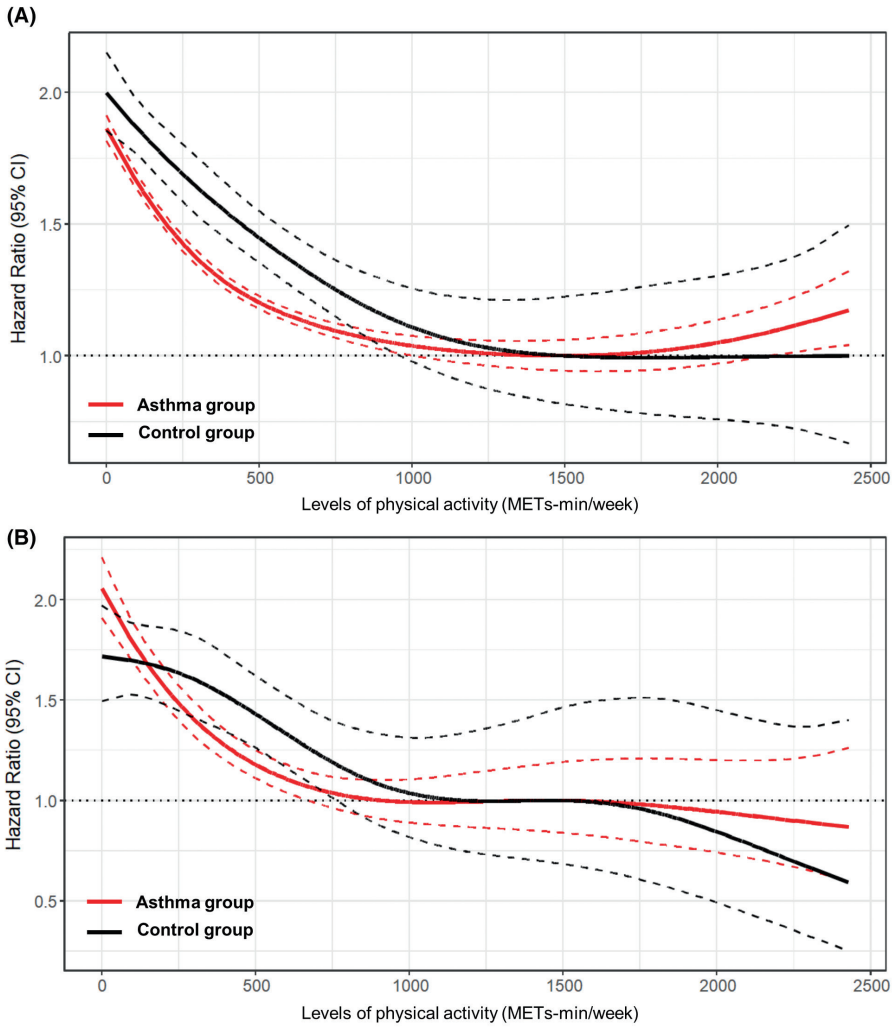

FIGURE 1 Association between changes in physical activity and the risk of (A) overall mortality and (B) respiratory mortality stratified by the presence of asthma. A nonparametric Cox model with a penalized spline was used after adjusting for age, sex, smoking history, body mass index, income level, alcohol consumption, Charlson comorbidity index and physical activity (continuous variable). Abbreviation: CI, confidence interval; METs, metabolic equivalents

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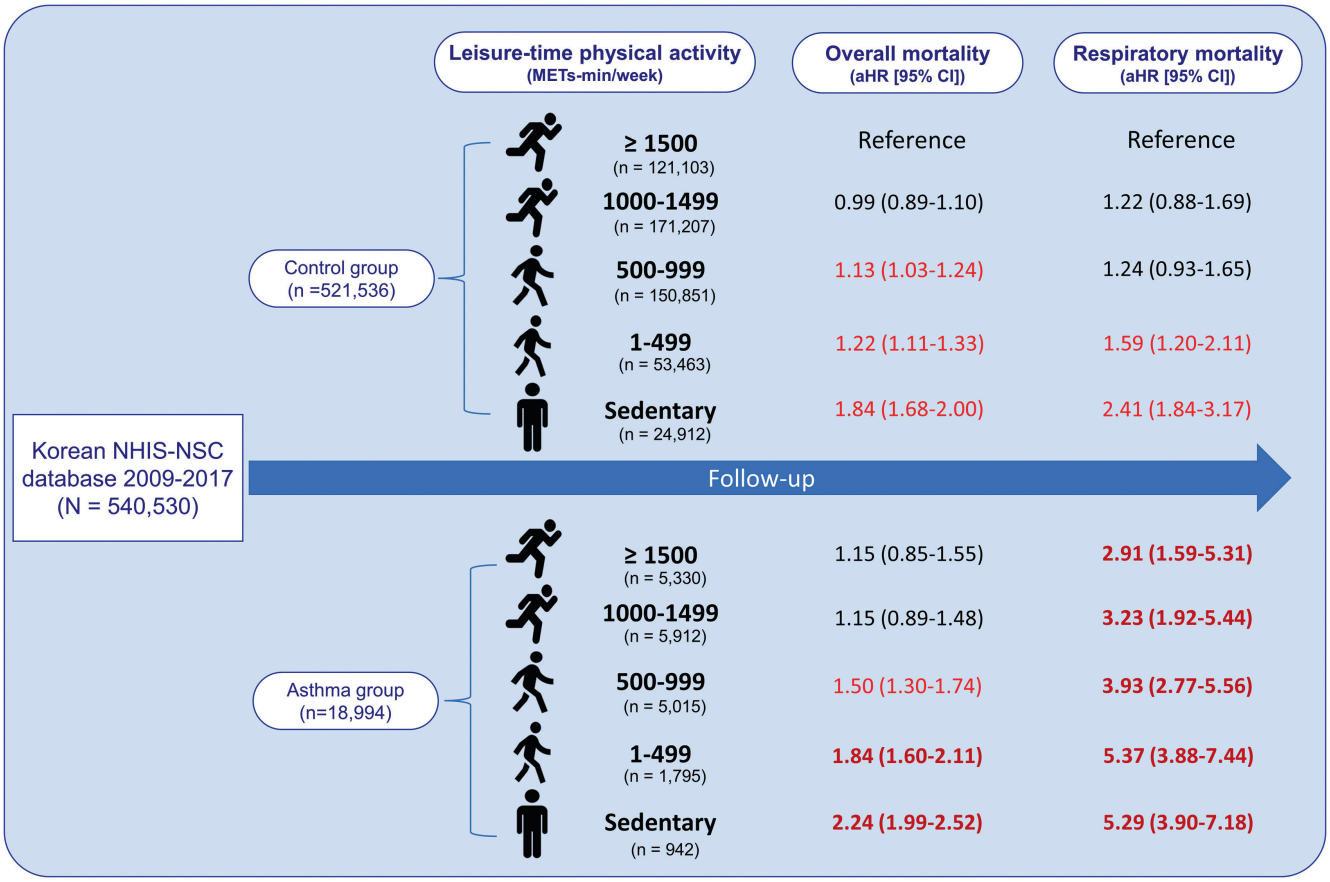

FIGURE 2 Adjusted HR for overall and respiratory mortality according to the presence of asthma and the level of physical activity relative to the physical activity of ≥1500 METs-min/week in the control group. Data are presented as a ratio (95% CI). Multivariable Cox proportional hazards regression modelling was performed after adjusting for age, sex, smoking history, body mass index, income level, alcohol consumption, Charlson comorbidity index and physical activity (categorical variable). Abbreviation: aHR, adjusted hazard ratio; CI, confidence interval; METs, metabolic equivalents; NHIS-NSC, National Health Insurance Service-National Sample Cohort.

associated with a 20% reduction in overall mortality (0.80 [0.75–0.85]) and a 19% reduction in respiratory mortality (0.81 [0.72–0.91]) in the asthma group and an 18% reduction (0.82 [0.81–0.84]) in overall mortality and a 24% reduction (0.76 [0.72–0.81]) in the control group.

We have presented the first data addressing the impact of PA on mortality in subjects with asthma compared to those without asthma. Notably, compared with the presumed healthiest cohort, the control group with PA >1500 METs-min/week, sedentary asthmatics had a 2.2-fold increased risk of overall mortality, and PA was inversely associated with overall mortality risk in asthmatic subjects. Further, we found the effect of reduced PA on mortality to be especially pronounced for respiratory events. Interestingly, we found that increasing PA had a similar effect on reducing the risk of mortality in both asthma and control groups, indicating that asthma did not blunt the effect of PA on the prevention of mortality.

One important limitation of our study is that we could not consider other health-promoting lifestyles (e.g. healthy diet or good sleeping), leaving a doubt that how much of the association is due to PA and how much is due to other lifestyles. Thus, future studies planning to evaluate this topic should consider the effect of health-promoting habits.

AUTHOR CONTRIBUTIONS

H. Lee, J. Ryu, S-H. Kim and H.J. Yoon involved in study design. H. Lee and J. Ryu involved in data analysis. H. Lee and S-H. Kim involved in writing the manuscript. All authors involved in data interpretation, and reviewing and revising the manuscript.

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SUPPORTING INFORMATION

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Varying effects of greenness in the spring and summer on the development of allergic rhinitis up to 27 years of age: The Espoo Cohort Study

To the Editor,

The world has experienced considerable growth of urban areas in recent decades, with approximately 54% of the world population living in cities.[1] While this development provides some benefits, unplanned, uncontrolled and rapid urbanization has also been associated with environmental degradation, land changes and loss of green areas.[2] Epidemiological studies on the association between urban greenspaces and development of allergic diseases have provided inconsistent results.[3] This heterogeneity in the effects of greenspaces on the development of allergic rhinitis could be explained by the season of exposure. Thus, we aimed to estimate potential associations between exposure to greenspaces during pregnancy and early life, in spring and summer seasons, and development of allergic rhinitis up to 27 years of age.

The study comprised data collected in the Espoo Cohort Study, which included 2568 children delivered between 1984 and 1990