

Moderate-to-Vigorous Physical Activity Changes with the Risk of SARS-CoV-2 Infection: A Nested Case-Control Study

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Abstract. We identified the association of changes in moderate-to-vigorous physical activity (MVPA) with SARS-CoV-2 infection. From 6,396,500 patients, we performed a nested case-control study who participated in both biennial check-ups. Adjusted odds ratios (aOR) and 95% confidence intervals (CI) were calculated using multivariable logistic regression. From physically inactive patients at period I, the odds increased when engaged in 1-2, 3-4, or ≥ 5 times of MVPA/week at period II. This study found that MVPA was directly associated with SARS-CoV-2 infection.

Keywords. Moderate-to-vigorous physical activity; COVID-19; nested case-control study

1. Introduction

From 2020, COVID-19 has spread globally causing a global pandemic. Some studies suggested the immune benefits of moderate-to-vigorous physical activity (MVPA) [1,2], or no direct association with COVID-19 [3].

2. Methods

From 6,396,500 patients enrolled in National Health Insurance Service, we performed a nested case-control study who participated in both biennial health screenings from period I (2017-18) to II (2019-20). MVPA was measured by self-reported questionnaires and categorized as physically inactive, 1-2, 3-4, or ≥ 5 times of MVPA/week. The patients were followed from January 1, 2021 until the diagnosis of COVID-19 or the study end date of December 31. The outcome was set as a positive diagnosis of SARS-CoV-2 infection. Adjusted odds ratio (aOR) and 95% confidence interval (CI) were calculated using age- and multivariable logistic regression.

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3. Results

There were 184,201 patients with and 1,935,414 patients without COVID-19. For those that were physically inactive at period I, the risk increased when engaged in 1-2 (aOR, 1.09; 95% CI, 1.06-1.11), 3-4 (aOR, 1.11; 95% CI, 1.08-1.13), or ≥ 5 times of MVPA/week (aOR, 1.19; 95% CI, 1.17-1.22) at period II. Similarly, for those that engaged in ≥ 5 times of MVPA/week at period I, the risk decreased when engaged in 3-4 (aOR, 0.96; 95% CI, 0.92-0.99), 1-2 (aOR, 0.88; 95% CI, 0.84-0.92), or physically inactive (aOR, 0.83; 95% CI, 0.79-0.86) at period II (Table 1).

Table 1. Changes in MVPA between period I (2017-18) and II (2019-20) with risk of SARS-CoV-2 infection

MVPA/week	Event (%)	Age-adjusted OR (95% CI)	Adjusted OR (95% CI) ^a
Physically inactive at period I (2017-18)			
Continuously physically inactive	37,328 (8.8)	1.00 (reference)	1.00 (reference)
Physically inactive to 1-2 times	17,330 (9.0)	1.03 (1.01-1.05) ^c	1.09 (1.06-1.11) ^d
Physically inactive to 3-4 times	17,678 (8.8)	1.00 (0.98-1.01)	1.11 (1.08-1.13) ^d
Physically inactive to ≥ 5 times	30,150 (8.8)	1.00 (0.99-1.02)	1.19 (1.17-1.22) ^d
<i>P</i> for trend		0.032	<0.001
≥ 5 times of MVPA at period II (2019-20)			
≥ 5 times to physically inactive	4,707 (8.7)	1.01 (0.97-1.05)	0.83 (0.79-0.86) ^d
≥ 5 times to 1-2 times	3,136 (8.7)	0.80 (0.77-0.84) ^d	0.88 (0.84-0.92) ^d
≥ 5 times to 3-4 times	6,110 (8.7)	0.94 (0.90-0.97) ^d	0.96 (0.92-0.99) ^b
Continuously ≥ 5 times	22,150 (8.5)	1.00 (reference)	1.00 (reference)
<i>P</i> for trend		<0.001	<0.001

^aAdjusted for age, sex, household income, body mass index, hypertension, diabetes, dyslipidemia, Charlson comorbidity index, smoking, alcohol consumption, and the dose of COVID-19 vaccination.

^b*P*<0.05. ^c*P*<0.01. ^d*P*<0.001.

4. Conclusions

In this large study, an increase in MVPA was positively associated with SARS-CoV-2 infection. The direct association can be explained by the high community engagement caused by MVPA [3]. Since the transmission of COVID-19 occurs by airborne droplets and close proximity, engaging in MVPA can result in high susceptibility to SARS-CoV-2 infection [4].

References

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