

Association Between Prior COVID-19 Infection and Heat-Related Illness: A Matched Case-Control Study in Military Personnel

Daniell Agaev¹, Ziv Talmi^{1,2}, Mor Zarfati Schneider¹, Jihad Ali¹, Amir Abu Rabia^{1,3}, Liran Reches^{1,2}, Noa Sofer Sali¹, Itay Ketko¹

¹Institute of Military Physiology, Trauma and Operational Medicine Division, Surgeon General Headquarters, Israel Defense Forces; Medical Corps, Israel; ² Internal Medicine Wing, Hadassah Medical Center, Jerusalem, Israel; ³Plastic Division, Soroka Medical Center, Be'er Sheva, Israel;

Introduction

- Heat-related illness (HRI) threatens military readiness and individual health.
- Although the acute effects of COVID-19 are well characterized, its long-term impact on thermoregulation remains uncertain.
- It is unknown whether prior SARS-CoV-2 infection increases susceptibility to thermoregulatory failure during physical exertion.
- Objective:** To evaluate whether prior COVID-19 infection was associated with HRI occurrence within 8 months of recovery in military personnel.

Methods

- Study design:** Matched case-control study using the IDF HRI database from 2020-2024.
- Data collection:** COVID-19 test results, clinical symptoms, and body mass index were extracted from electronic health records for the 8 months preceding each HRI event.
- Matching:** Cases were matched 1:4 with controls by military occupation, unit, training phase, sex, and age.
- Subject classification:**
 - Positive: Confirmed COVID-19 test result.
 - Negative: No evidence of infection or symptoms.
 - Possible: Documented clinical symptoms without a formal COVID-19 test result.
- Statistical analysis:** Conditional logistic regression and bootstrap analyses were performed. E-values were calculated to assess the potential impact of unmeasured confounding.

Results

- The study included 261 HRI cases and 1,048 matched controls.
- Confirmed COVID-19 was more common in cases than controls (4.9% vs. 1.5%), as was possible infection (28.3% vs. 15.4%).
- After BMI adjustment, the odds of HRI were 7.81-fold higher with confirmed infection (95% CI 3.00-20.20) and 2.07-fold higher with possible infection (95% CI 1.26-3.39).
- E-values were 15.12 and 3.56.
- Bias analysis assuming non-differential test misclassification, 60% sensitivity, and 99.5% specificity yielded ORs of 10.51 (95% simulation interval 3.95-28.38) and 2.59 (1.56-4.32).

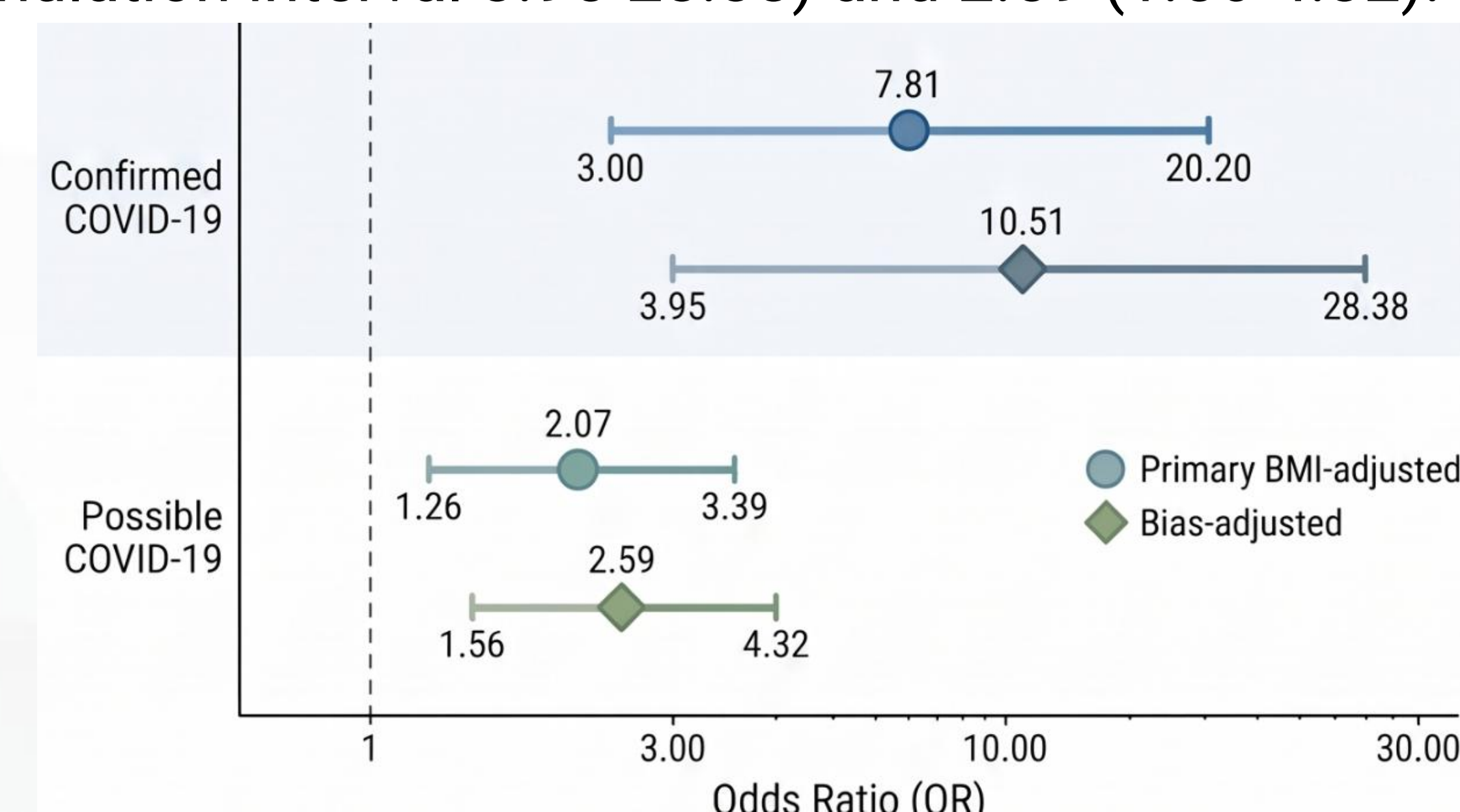
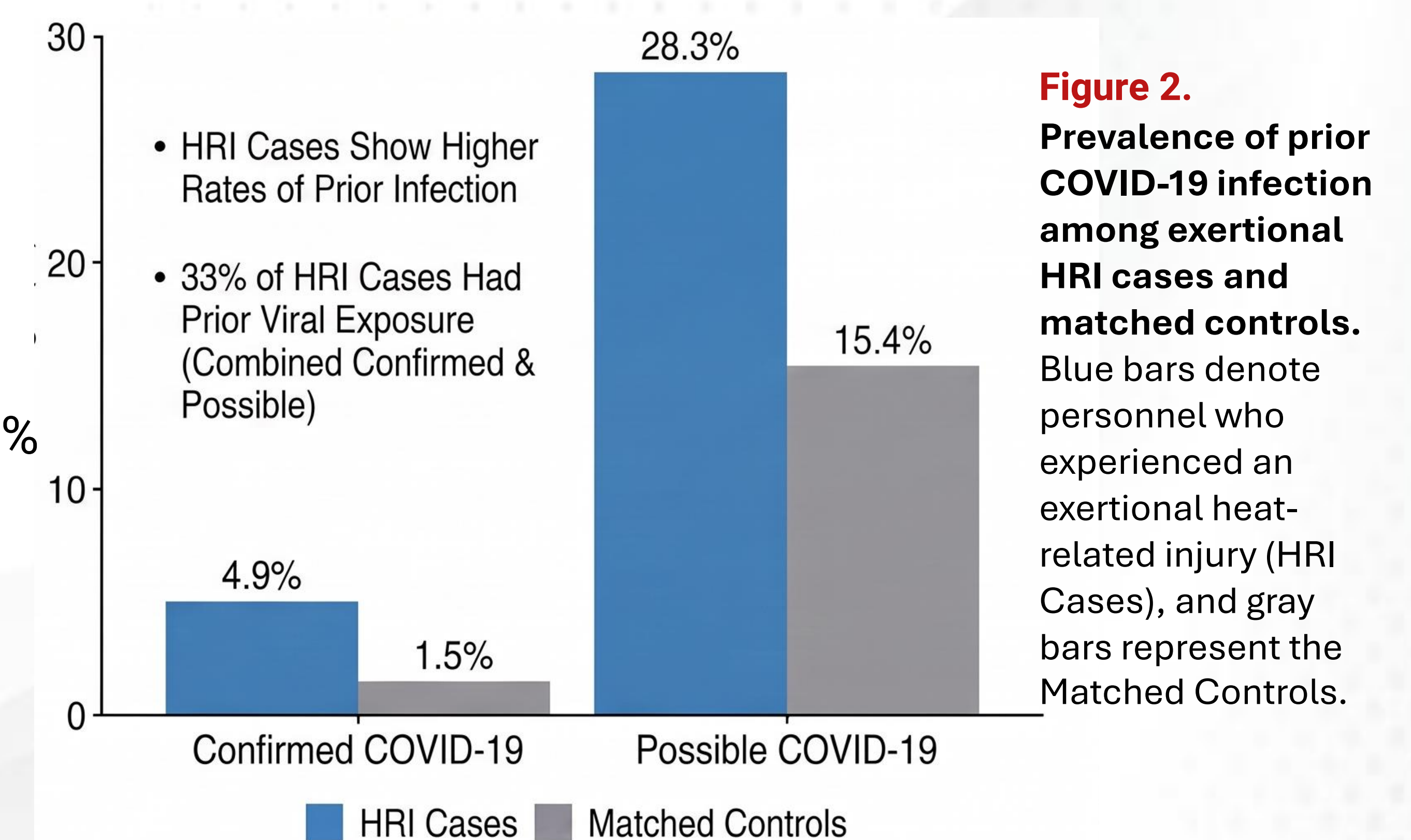
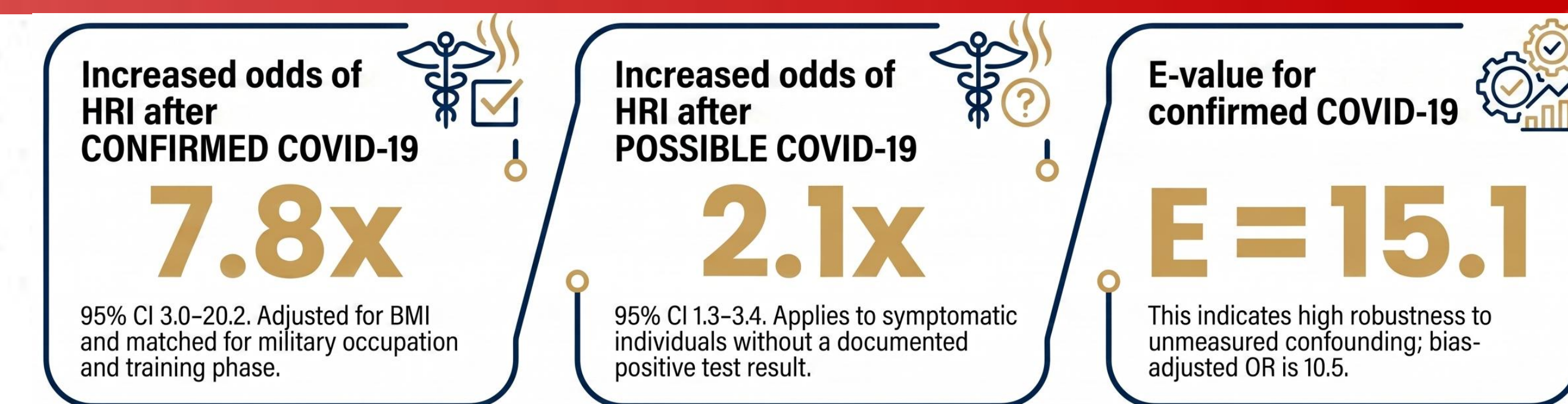


Figure 1. Association between prior COVID-19 exposure and subsequent exertional heat-related injury (HRI) risk in military personnel. Round shapes represent primary BMI-adjusted models, and diamonds indicate bias-adjusted models that evaluate robustness to residual confounding.

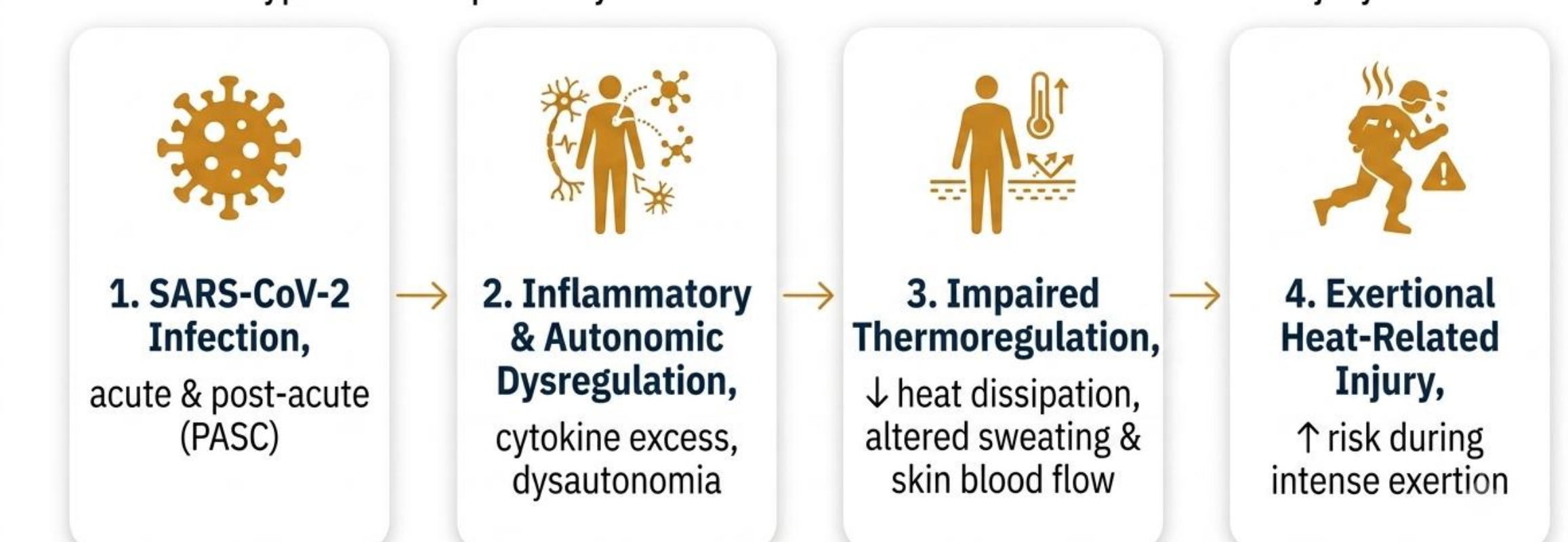
Conclusions

- Prior COVID-19 infection was independently associated with increased HRI risk, suggesting possible prolonged impairment in thermoregulation and greater vulnerability during intense physical exertion.
- COVID-19 history should be incorporated into screening before high-load training, operational activity, and heat exposure. A graduated return-to-activity process using a Heat-Effort Scale, together with closer monitoring during strenuous training, may reduce preventable HRI and support operational readiness.



Proposed Mechanism: Pathway from COVID-19 Infection to Exertional Heat Injury

Hypothesized pathway from SARS-CoV-2 infection to exertional injury



Corresponding author: Daniell agaev; Email: Daniell.agaev@gmail.com

Disclosures: The views expressed in this abstract are those of the authors and do not necessarily reflect the official policy or position of the IDF or the Israeli MOD. The authors declare no conflicts of interest or disclosures relevant to the content of this research.



**At the moment of truth,
IDF MEDICAL CORPS.**

