EXERCISE CAPACITY IS REDUCED IN HIV INDEPENDENT OF SARS-COV-2 INFECTION

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BACKGROUND

- Reduced exercise capacity occurs as a post-acute sequela of COVID-19 ("PASC" or "Long COVID").
- Cardiopulmonary exercise testing (CPET) is the gold standard for measuring exercise capacity and identifying reasons for exercise limitations.
- Only one prior study used CPET to examine exercise limitations among people living with HIV (PLWH).
- Extending our prior findings in PASC, we hypothesized that PWH would have a greater reduction in exercise capacity after SARS-CoV-2 co-infection due to chronotropic incompetence (inability to increase heart rate).

METHODS

- We performed noninvasive CPET within a COVID recovery cohort that included PWH (NCT04362150) as well as vaccinated, SARS-CoV-2 uninfected PWH.
- We evaluated associations of HIV and prior SARS-CoV-2 infection with or without PASC with: (1) exercise capacity (peak oxygen consumption, VO_2) and (2) adjusted heart rate reserve (AHRR, marker of chronotropic incompetence) using linear regression with adjustment for age, sex, and body mass index.

Table 1. Demographics, Medical History, SARS-CoV-2 Characteristics

	People with HIV (N=37)	People without HIV (N=46)
Age, median [IQR]	57 (53, 62)	49 (40, 57)
Female Sex	5 (14%)	24 (52%)
Hispanic//Latinx Black/African American Asian/Pacific Islander White	11 (32%) 7 (21%) 0 16 (47%)	8 (18%) 1 (2%) 6 (13%) 30 (67%)
Hypertension Diabetes Asthma/COPD* Ever Smoker*	16 (43%) 6 (17%) 2 (11%) 7 (47%)	6 (13%) 3 (7%) 10 (23%) 9 (24%)
Body Mass Index, kg/m^2	28.7±5.2	30.1±7.8
Hospitalized for COVID-19	1/23 (4%)	7/46 (15%)
Vaccinated at time of CPET	35 (95%)	44 (96%)
SARS-CoV-2 Infected	23/37 (62%)	46/46 (100%)
Long COVID Symptoms at CPET	11/23 (48%)	28/46 (61%)
Months since SARS-CoV-2 infection	16.0 (14.5, 17.2)	18.0 (16.3, 20.0)

Exercise capacity is reduced among PWH independent of SARS-CoV-2 infection or PASC. **Chronotropic incompetence** may be a mechanism of reduced exercise capacity among PWH.

RESULTS

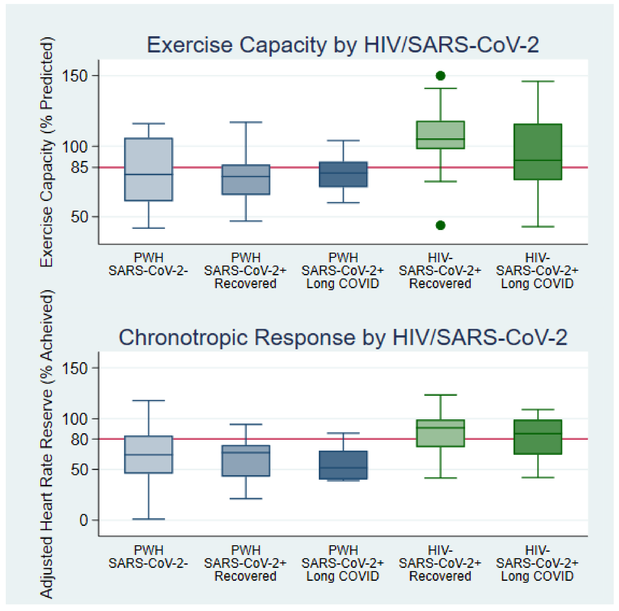
- We included 83 participants including 37 PWH (45%)
- Characteristics of PWH (n=37):
  - All virally suppressed on ART
  - 21 years after HIV diagnosis (IQR 15-28)
  - CD4 608 (IQR 270-736)
  - CD4/CD8 ratio 0.92 (IQR 0.56-1.27)

Table 2. Key CPET Findings

	People with HIV (N=37)	People without HIV (N=46)	Unadjusted p value
Exercise Capacity <85% Predicted (of maximal tests)	21/33 (63%)	13/45 (29%)	P=0.002
Peak VO_2 (% Predicted)	80±20	99±25	0.0004
Peak VO_2 (ml/kg/min)	22.4±6.8	25.2±9.3	0.14
Adjusted Heart Rate Reserve (%)	63±23	83±20	<0.0001
Chronotropic Incompetence	14/37 (38%)	6 (13%)	P=0.01

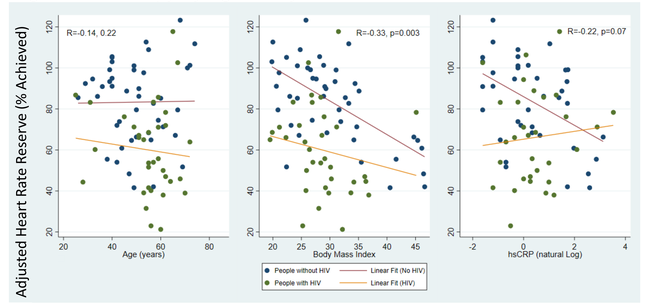
Adjusted Difference in Peak VO_2 by HIV:
-24% predicted (95% CI 12-36, p<0.001)
-5.5 ml/kg/min (95%CI 2.7-8.2, p<0.001)

Fig 1. Exercise Capacity and Chronotropy by HIV/SARS-CoV-2 Status



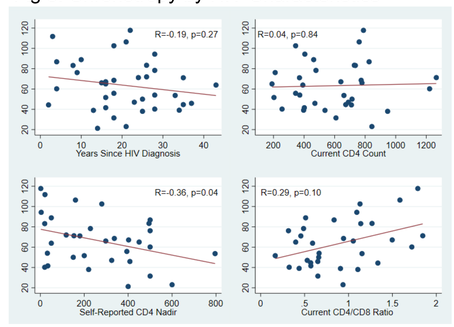
Exercise capacity did not vary by SARS-CoV-2 infection among PWH (p=0.48 for uninfected vs infected; p=0.25 for uninfected vs no PASC; p=0.32 no PASC vs PASC).
Chronotropic Incompetence Increased among PWH with PASC:
- 7/26 (27%) without PASC vs 7/11 (64%) with PASC (p=0.04)

Fig 2. Chronotropy by Age, Body Mass Index, and hsCRP



Peak VO_2 and adjusted heart rate reserve were lower among PWH independent of age, BMI, and hsCRP (p<0.001 for each); higher BMI was associated with lower adjusted heart rate reserve (-7% per 5 kg/m^2 increase) independent of HIV.

Fig 3. Chronotropy by HIV Characteristics



Years since HIV diagnosis, CD4 nadir, current CD4 count & CD4/CD8 ratio, were not associated with peak VO_2 or AHRR.

CONCLUSIONS

- Exercise capacity is reduced among PWH, with no large differences by SARS-CoV-2 infection or PASC.
- Chronotropic incompetence may be an under-recognized mechanism of exercise intolerance among PWH and may be more common among PWH with PASC.

Contact

Please email Matt Durstenfeld at matthew.Durstenfeld@ucsf.edu with any questions!

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