



Post-Acute Sequelae of COVID-19 in Active Duty United States Marines and Effects on Duty Status

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Presentation objectives

- 1) Estimate the rate of Post Acute Sequelae of COVID-19 (PASC), also called chronic-COVID-19, among newly accessioned active duty Marines
- 2) Determine the effects of PASC on medical readiness including incidence rates of common symptoms and effects on mental health
- 3) Describe the effects of PASC on fitness using objective military data and compare to a historic cohort



CHARM 2 study design

24 Aug 2021

US DoD mandates COVID-19 vaccinations

May-Nov, 2020

CHARM

Longitudinal,
prospective study at
Parris Island, SC

February 2021- June 2022

CHARM 2

Repeated cross-sectional study
11 military installations in US and Japan

Visit 1

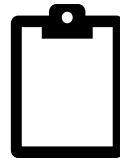
Visit 2

Visit 3

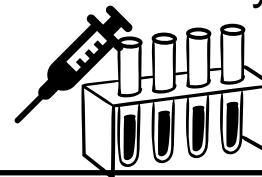
Brief and consent



Survey



Phlebotomy



Physical fitness



Combat Fitness



Rifle range



PASC
Evaluation



CHARM 2 cohort



- Marines who participated in CHARM 1
 - Followed weekly for 2 weeks during 14 day quarantine then biweekly for 6 weeks
 - 6 visits over 8 weeks
 - 3,249 total participants (17% attrition rate)
 - 1,107 (44.8%) SARS-CoV-2 PCR positive; almost 2/3 asymptomatic
 - Well characterized cohort with serology, neutralizing antibody, transcriptomic, metagenomic, functional T and B cell assays
- CHARM 2
 - Who: Anyone who was in CHARM 1; SARS-CoV-2 + or -
 - What: Assessment of long-term effects of SARS-CoV-2 infection
 - Where: 7 US States and Marine installation in Japan
 - When: February 2021 - June 2022
 - Why: Improve force health protection
 - How: Repeated cross-sectional design at locations where Marines were stationed

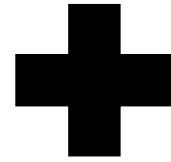


Personal photos from speaker

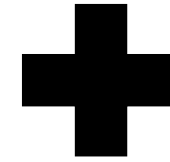


Definitions of PASC

**SARS-CoV-2
infected**



**Symptoms
consistent
with PASC**



**Duration
> 4 weeks**

CONFIRMED:

SARS-CoV-2 infection documented in
CHARM 1

HIGHLY PROBABLE:

IgG antibody positive
OR
told they had COVID *and*
self-report a positive COVID test

POSSIBLE:

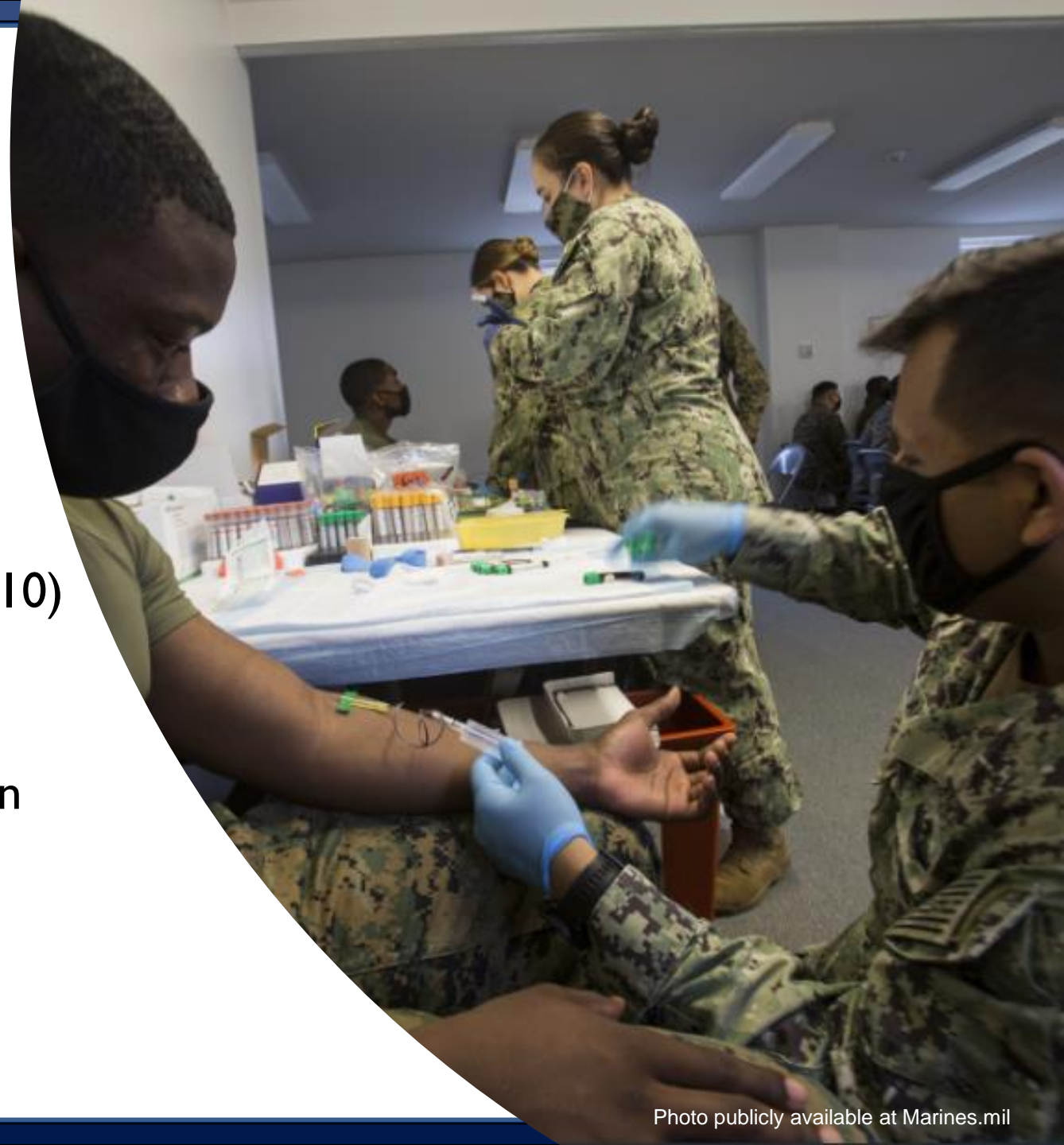
self-report being told they had COVID
OR
self-reporting a positive COVID test

For the purpose of this study, we defined post-acute COVID-19 as persistent symptoms and/or delayed or long-term complications of SARS-CoV-2 infection beyond 4 weeks from the onset of symptoms or time of PCR positivity



Results

- 910 participants
 - 835/910 (91.8%) male
 - 622/910 (68.4%) white
 - Mean age: 19.2 (std dev: 2.0)
- Number of days between visits (mean)
 - CHARM 1.0 enroll to visit 1: 330 (n=910)
 - Visit 1 to visit 2: 236 (n=142)
 - Visit 2 to visit 3: 251 (n=2)
- Previously infected with SARS-CoV-2 upon entering CHARM 2: 857/910 (94.1%)
 - Confirmed: 371 (43.3%)
 - Highly probable: 481 (56.1%)
 - Possible: 5 (0.6%)



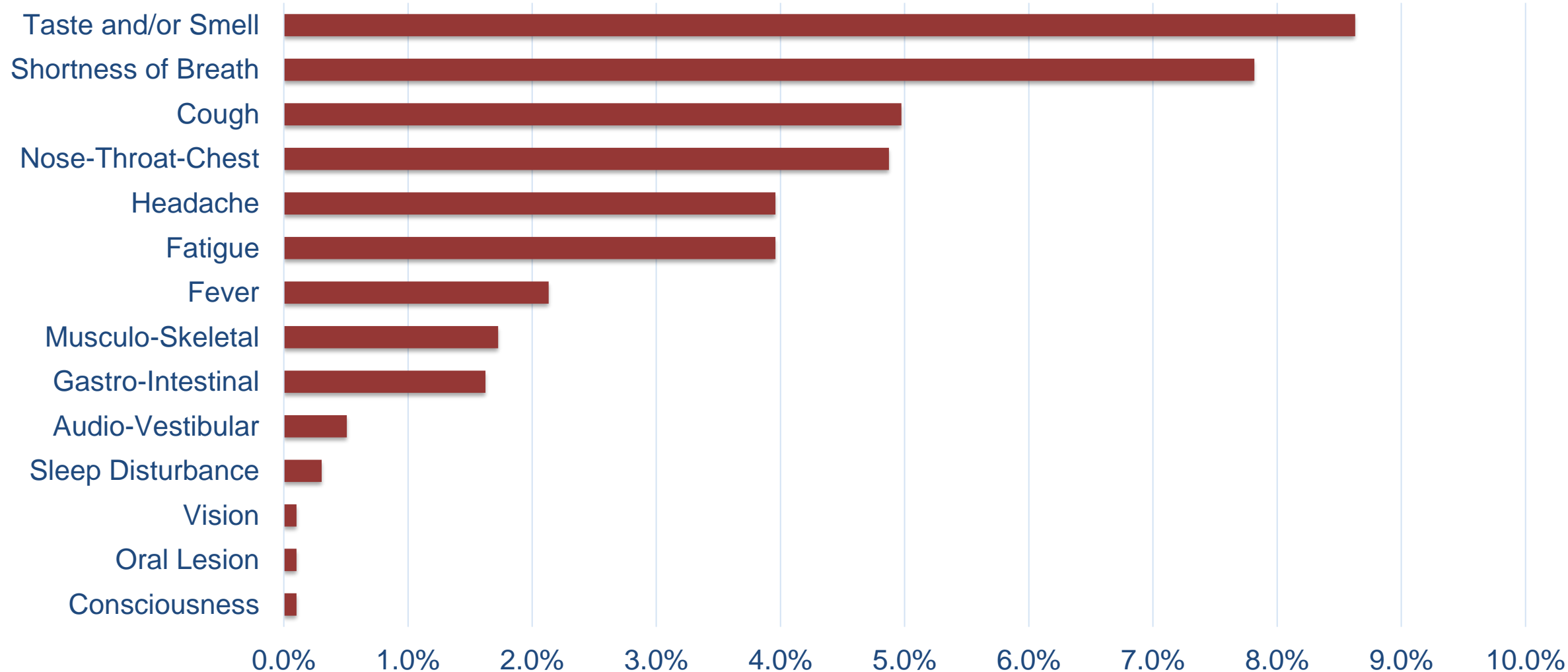


PASC and medical readiness

- Overall prevalence of PASC: 212/857 (24.7%)
 - 910 enrolled → 857 likely had SARS-CoV-2 → 212 with PASC
- Illness/symptom rating
 - Normal: 638/857 (74.4%)
 - Mild: 162/857 (18.9%) Not at full duty; lingering symptoms; may or may not have sought medical care
 - Moderate: 45/857 (5.2%) Significantly affecting ability to perform job; difficulty functioning; likely sought medical care
 - Severe: 5/857 (0.6%) Unable to performance job; threatening career in military; obtained medical care
- Received medical care for PASC concern: 51/857 (6%)
- Missed work or unable to fulfill duty/activities: 162/857 (18.9%)
- Have not returned to pre-COVID-19 health 231/857 (27%)



Incident PASC symptoms among 212 Marines

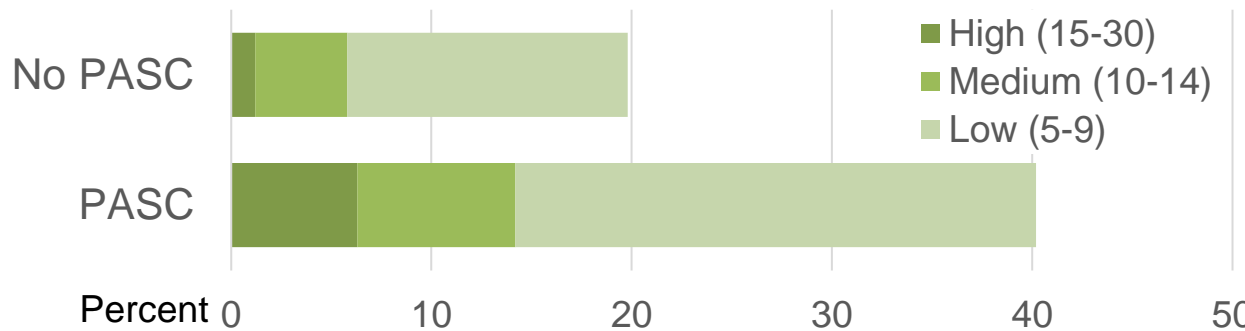




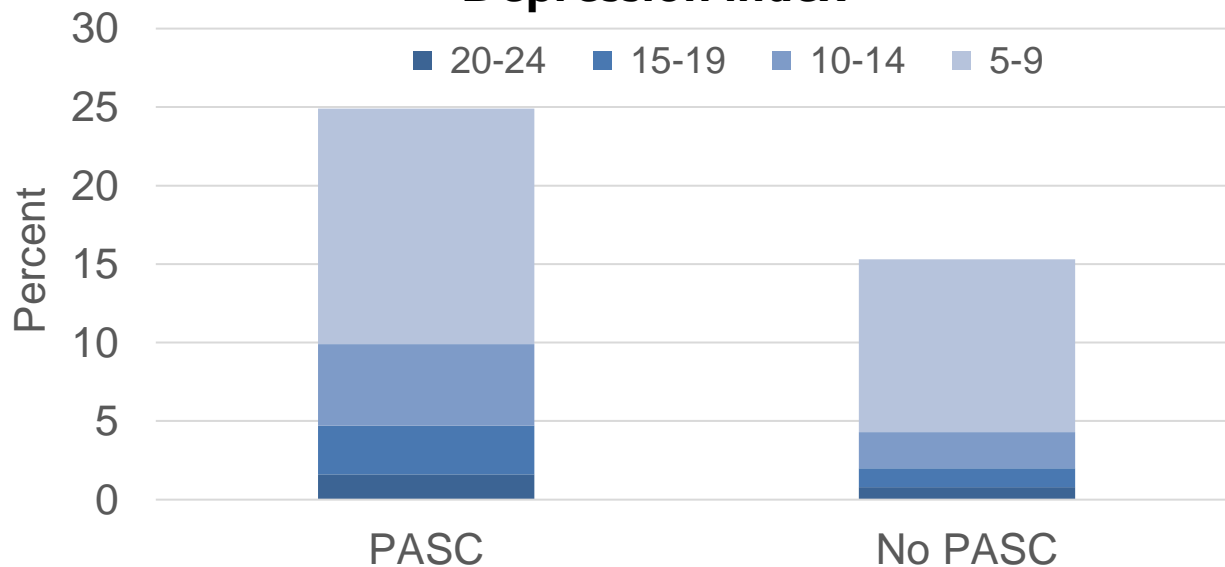
PASC and mental health

212 participants with PASC compared to 698 without PASC

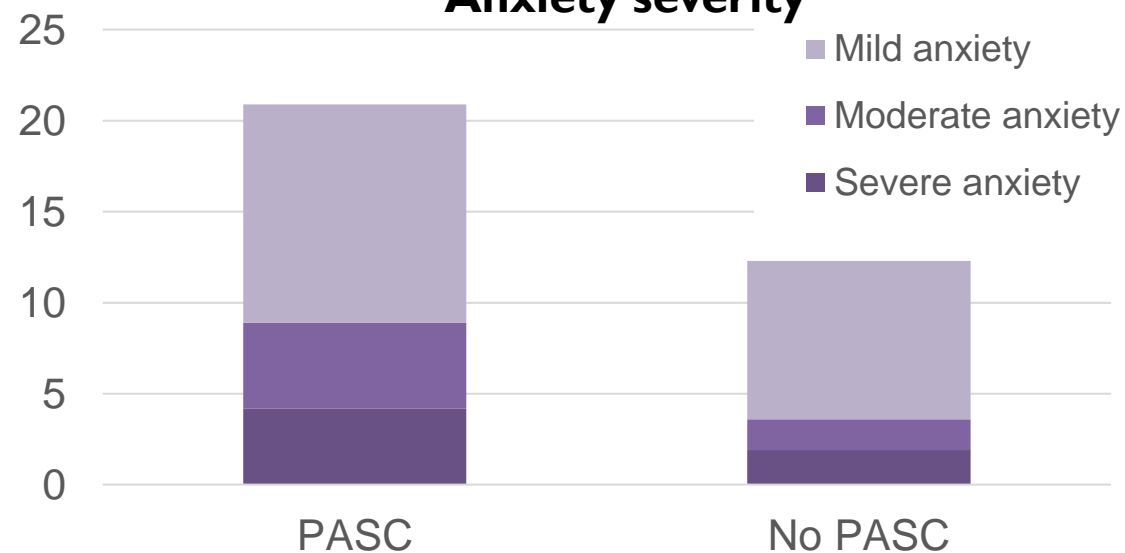
Patient Health Questionnaire (PHQ)-15 Somatic symptom severity



Patient health questionnaire (PHQ)-8 Depression index



Generalized anxiety disorder (GAD)-7 Anxiety severity





PASC and fitness

Test		PASC n=212 (SD)	No PASC n=698 (SD)	p-value
Physical fitness	Total score	234.98 (31.74)	241.60 (30.96)	0.01
	Number of pull ups	14.37 (5.43)	15.13 (5.40)	0.1
	Number of pushup	55.73 (16.10)	50.41 (13.57)	0.3
	Number of crunches	107.51 (15.75)	108.14 (14.29)	0.7
	3 mile (4.8 km) Run time (sec)	1,432 (155) [23 min 52 sec]	1,394 (150) [23 min 14 sec]	<0.001
Combat fitness	Total score	259.61 (28.43)	266.77 (26.06)	<0.001
	Ammo can lift	109.90 (21.46)	111.39 (17.84)	0.45
	Movement to contact	182.04 (21.92)	175.39 (19.21)	<0.001
	Maneuver under fire	153.32 (26.11)	146.51 (20.97)	0.002



Pandemic fitness compared to historic cohort



Marine fitness test	CHARM 2 cohort n=905 (SD)		2017-2019 historic cohort n=30041 (SD)		p-value
	Females n=76	Males n=829	Females n=5368	Males n=24673	
Physical fitness test total score*	224 (40)	228 (42)	242 (29)	251 (27)	<0.001
3 mile (4.8 km) Run time (sec)	1586 (140) [26 min 26 sec]	1353 (114) [22 min 33 sec]	1507 (124) 25 min 7 sec	1305 (100) [21 min 45 sec]	<0.001
Combat fitness test total score*	235 (41)	231 (46)	265 (27)	258 (29)	<0.001
Rifle range total score	305 (15)	311 (14)	291 (16)	300 (16)	<0.001

* Indicates a statistically significant ($p < 0.001$) decrease in score for all components of event



Conclusions

- **About ¼ of Marines** who were recruits in 2020 met the **definition of PASC**
- **PASC severity varied**, but approximately **6% sought medical care** for symptoms they thought were related to PASC
- Among Marines with PASC, the most prevalent symptoms were **loss of taste/smell, shortness of breath, cough**
- Significantly greater proportion of **somatic symptoms, depression, and anxiety** were present among Marines with PASC compared to those without
- Total scores on physical and combat fitness tests significantly decreased among Marines with PASC, especially cardiovascular events including **distance run, movement to contact, and movement under fire**. Not necessarily the case for strength events
- **Recruits trained during pandemic had lower physical and combat fitness test scores** when compared to historic cohort, especially in run time.



QuestionZ?

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- LCDR Elizabeth Cooper, MC, USN
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