# CORTICOMUSCULAR COHERENCE IN PRE-TREATMENT CANCER-RELATED FATIGUE vs CHRONIC FATIGUE SYNDROME

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## BACKGROUND

1. Fatigue is prevalent, highly debilitating & underdiagnosed in Cancer and Chronic Fatigue Syndrome (CFS)
2. The aetiology is poorly understood
3. No gold standard objective measure
4. Studies have shown a dissociation between brain and muscle signals during voluntary muscle fatigue

## OBJECTIVES:

- To evaluate the effect of muscle fatigue on corticomuscular coherence by determining EEG-EMG coherence during a motor task
- We hypothesized that corticomuscular coherence in βeta-band frequency would be weakened and decrease with fatigue in CRF & CFS compared to healthy controls (HC)

## METHODS

Participants:

12 newly diagnosed, pre-treatment, Non-Small Cell Lung Cancer (CRF)
12 Chronic Fatigue Syndrome (CFS)
12 Healthy Controls (HC)

### Data Collection Measures

- Brief Fatigue Inventory
- EEG & EMG were simultaneously recorded during a motor fatigue task by a hand-held dynamometer (Figure 1)

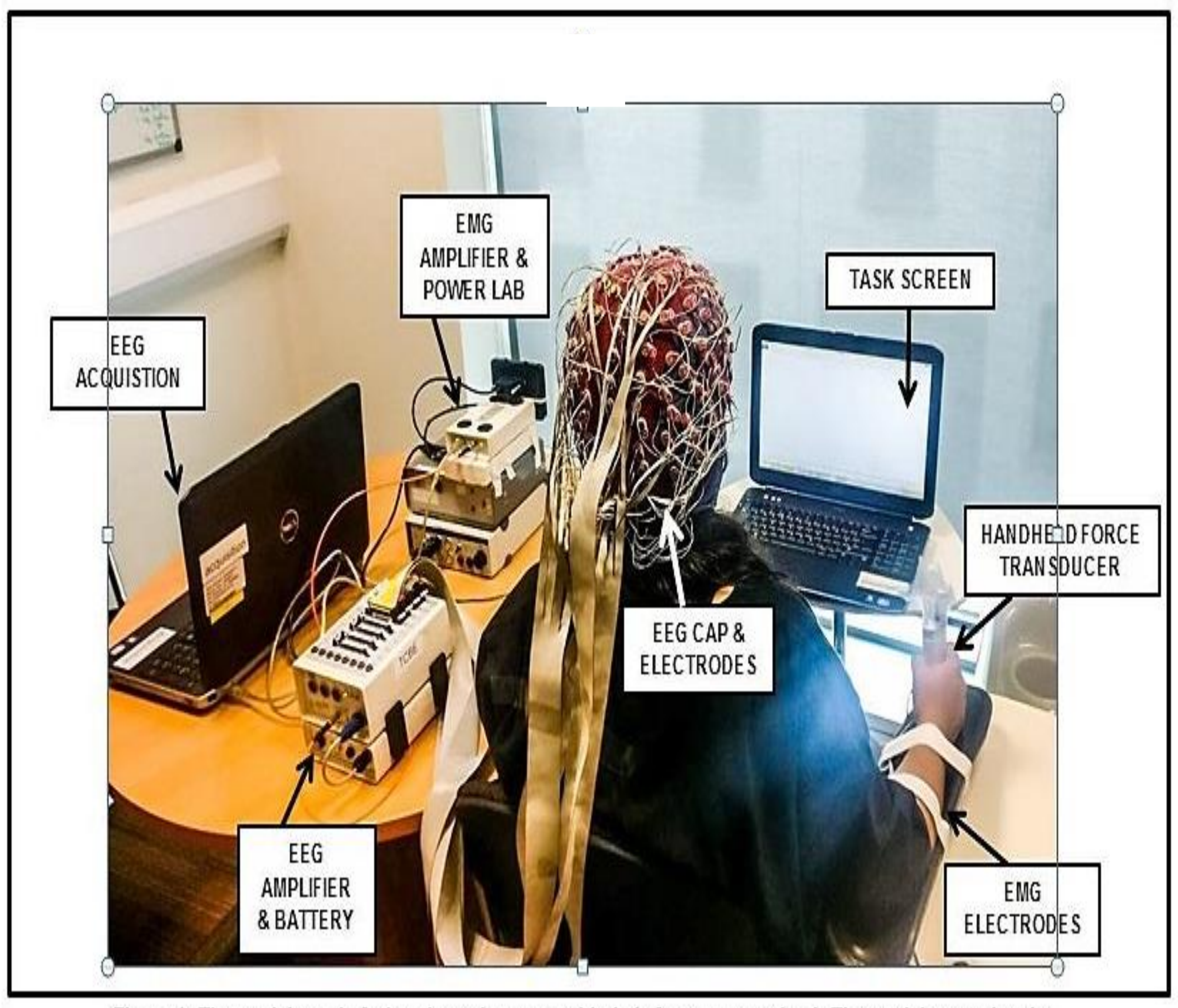


Figure 1: The participant is facing the task screen with their forearm restrained. The participant grips the handheld dynamometer and maintains 30% of their maximum voluntary contraction. Visual feedback is provided by the task screen. EEG and EMG are simultaneously recorded during the task.

## RESULTS

| Group | Gender | Age (years) | Brief Fatigue Inventory | Endurance Time (s) | Maximum Voluntary Contraction(N) |
|---|---|---|---|---|---|
| **CRF** | Female: 6<br>Male: 6 | 65 ± 11 | 3.2 ± 2 | 201 ± 165 | 305 ± 127 |
| **CFS** | Female: 8<br>Male: 4 | 49 ± 11 | 6.5 ± 1** | 291 ± 165 | 237 ± 65* |
| **HC** | Female: 5<br>Male: 7 | 50 ± 13 | 2.3 ± 2 | 512 ± 417 | 351 ± 152 |

[Table 1: Demographic details and Mean of AGE, BFI, ET and MVC scores. (*P<0.05, **P<0.001)]

- CFS significantly higher BFI mean fatigue (6.5 v 3.2, **p=0.005**) compared to CRF (Table 1)
- CRF and CFS weaker MVC and earlier exhaustion than HC (Table 1)
- EMG power (but not EEG) increased in both muscle groups in severe fatigue for HC and CRF but not CFS
- Coherence at lower βeta-band (15-25 Hz) significantly decreased in severe compared to mild fatigue (Figure 2) in FCU for HC & FCR for CRF
- Coherence at the broad βeta-band (15-35 Hz) no significant change

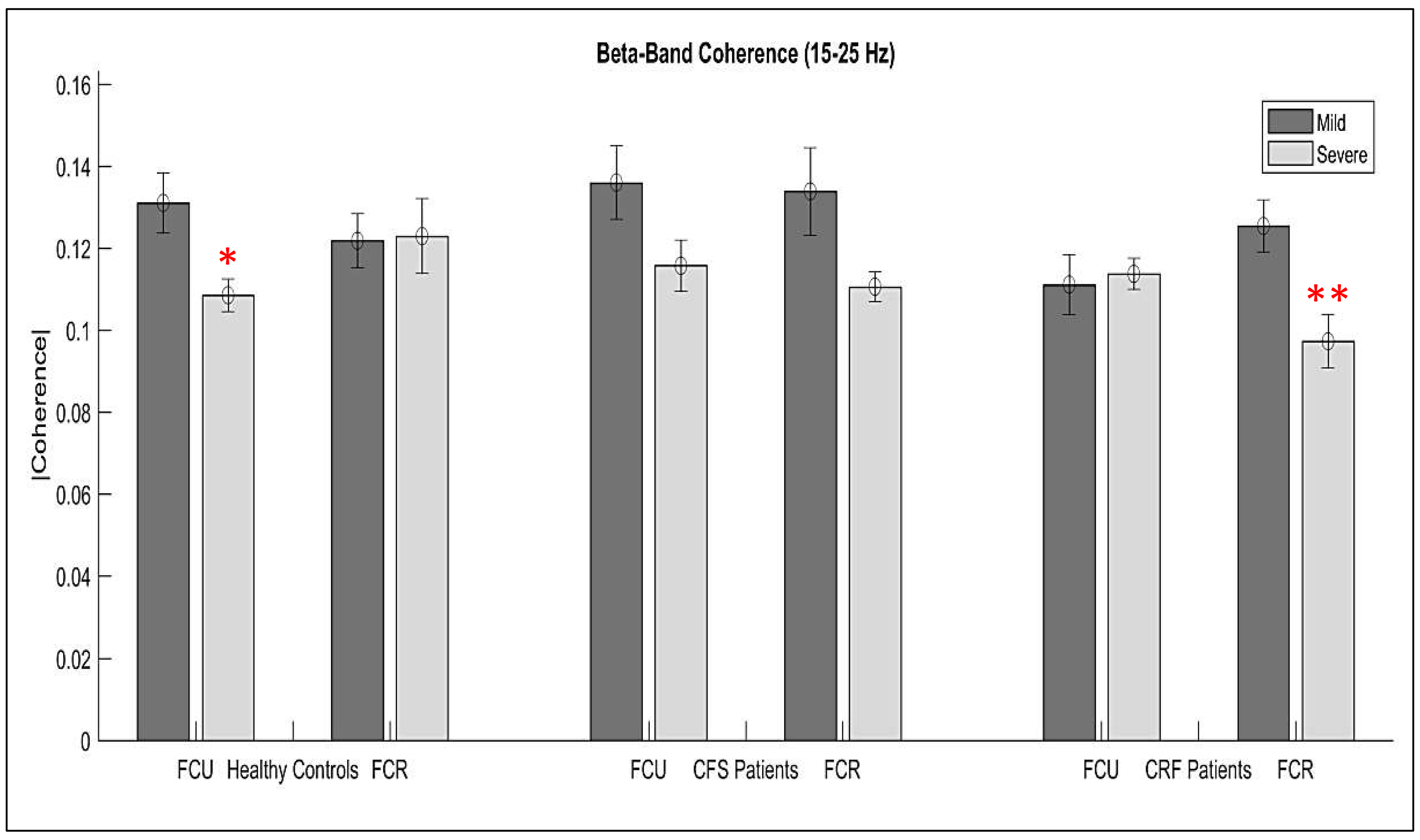


Figure 2: Lower βeta-band coherence changes over contralateral motor cortex for both muscles at each fatigue stage in all three cohorts. (*P<0.05, **P<0.001)

## CONCLUSIONS

1. CRF was associated with weakened corticomuscular coherence.
2. This suggests central mechanisms may contribute to CRF and CFS with associated performance impairment.
3. Interventions to improve coherence may reduce fatigue in CRF and CFS.
4. CRF is related to physiological alterations and is present at diagnosis before treatment

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