CUMULATIVE WORK POSTURES & FARM VEHICLE VIBRATIONS

EFFECTS ON FARMER HEALTH

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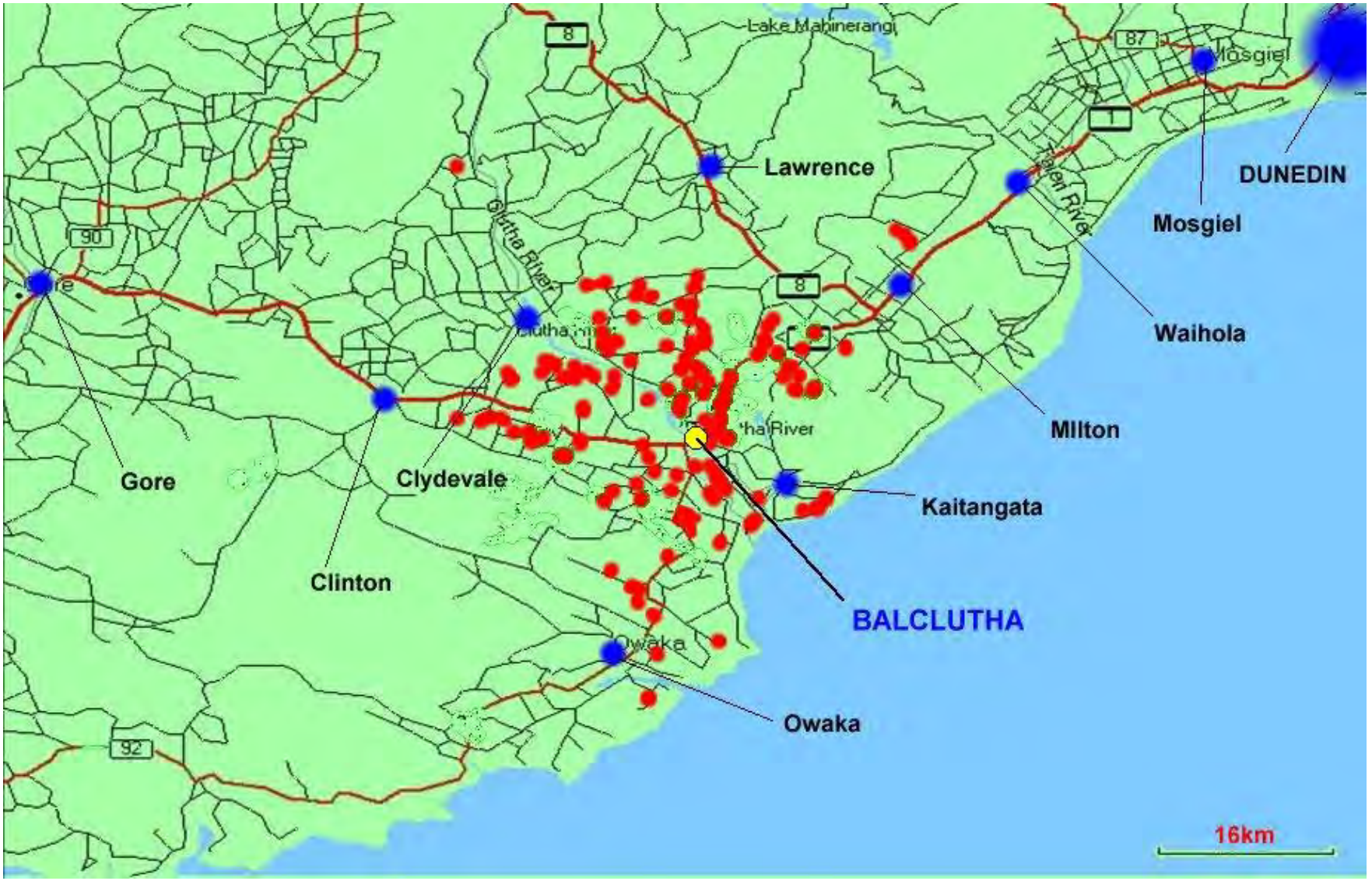
Background

- 12 month prevalence LBP in agriculture ~ 60%
- Singular event?
- Effect of prolonged and cumulative farm vehicle use?
- Quad bikes common farm vehicle (NZ, Aust, Can, US)
- Other farm vehicles

What is known

- Occupational WBV exposure
- WBV = increased risk of LBP
- Spinal resonance = 4-5Hz (vertical)
- Linked to spinal damage, balance & cognitive change
- Quad bike loss of control events are common

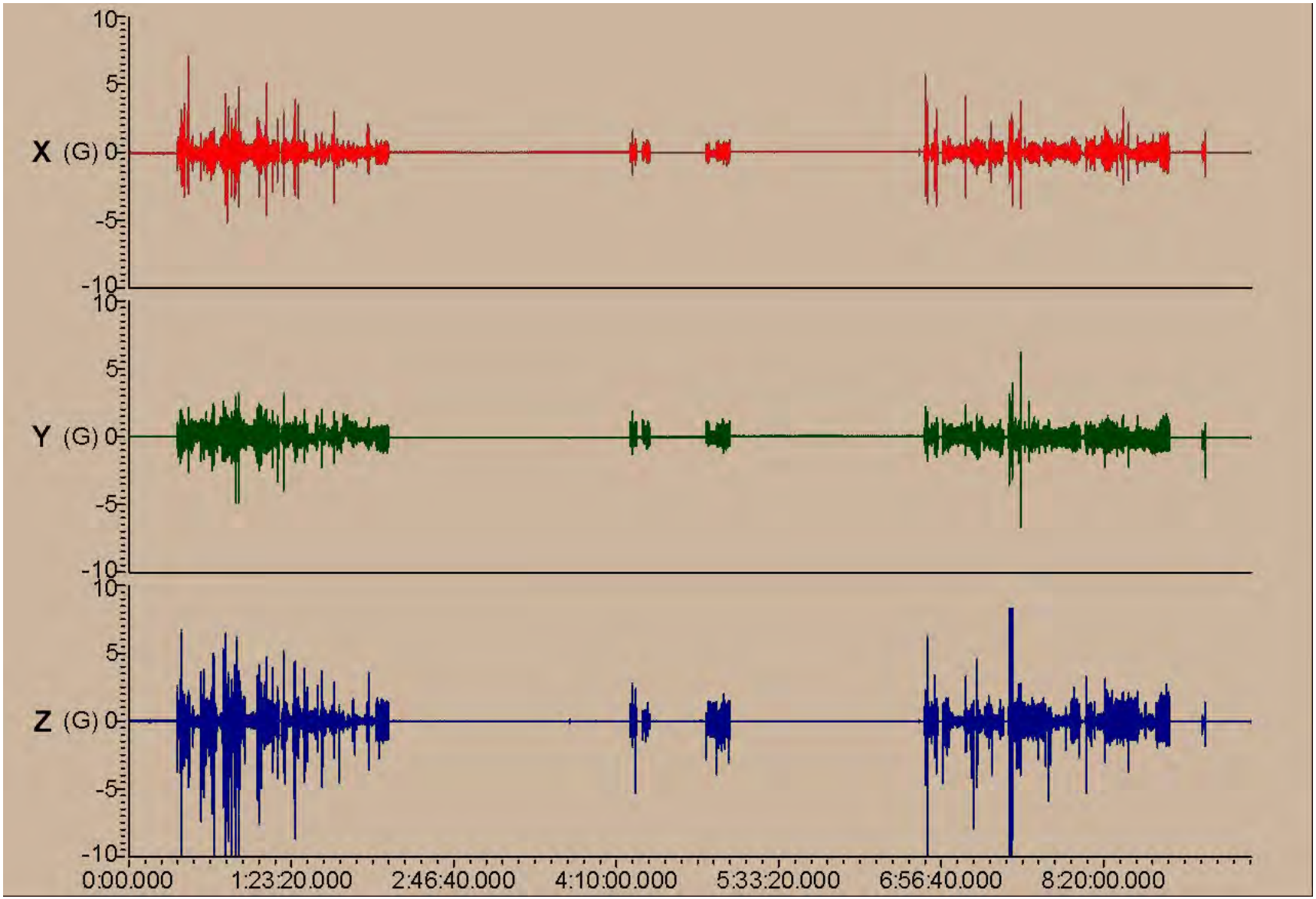

Lake Mahinerangi
8
87
Mosgiel
DUNEDIN
Lawrence
Taieri River
Mosgiel
90
Waihola
Clutha River
8
Milton
Gore
Clydevale
Kaitangata
Clinton
BALCLUTHA
Owaka
Owaka
92
16km

Raw Vibration Data (n=130 farmers)

Gathering Vibration Field Data

ATV use

- Mean daily data log 8.4 hrs
- Mean distance 22.2 km
- Mean actual vibration record 2.1 hrs
- Mean velocity 11.4 km/h


X (G)
Y (G)
Z (G)
10
5
0
-5
-10
0:00.000
1:23:20.000
2:46:40.000
4:10:00.000
5:33:20.000
6:56:40.000
8:20:00.000

12 month LBP

- 57.7% = LBP

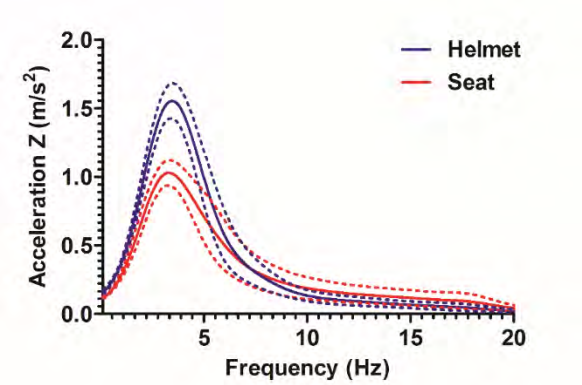
12 month neck pain

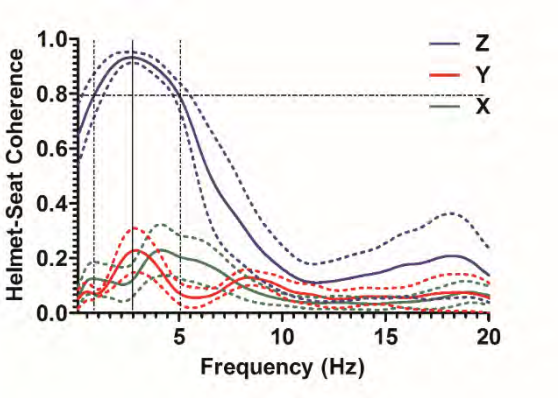
- 26.2% = neck pain
-

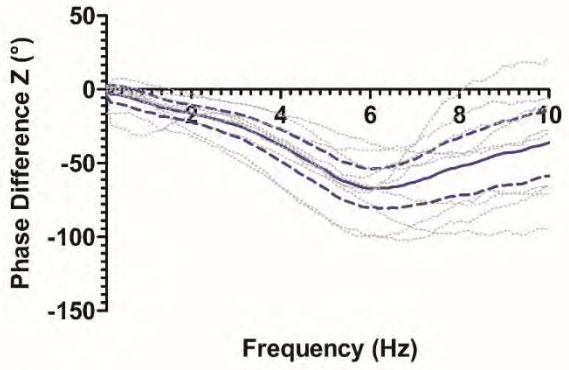
Survey
ATV loss of control (LOC) events

- 79 (61%) have had at least one LOC
- 200 LOC (31= single LOC)
  (48 = multiple LOC)
  (4 = > 9 LOC)

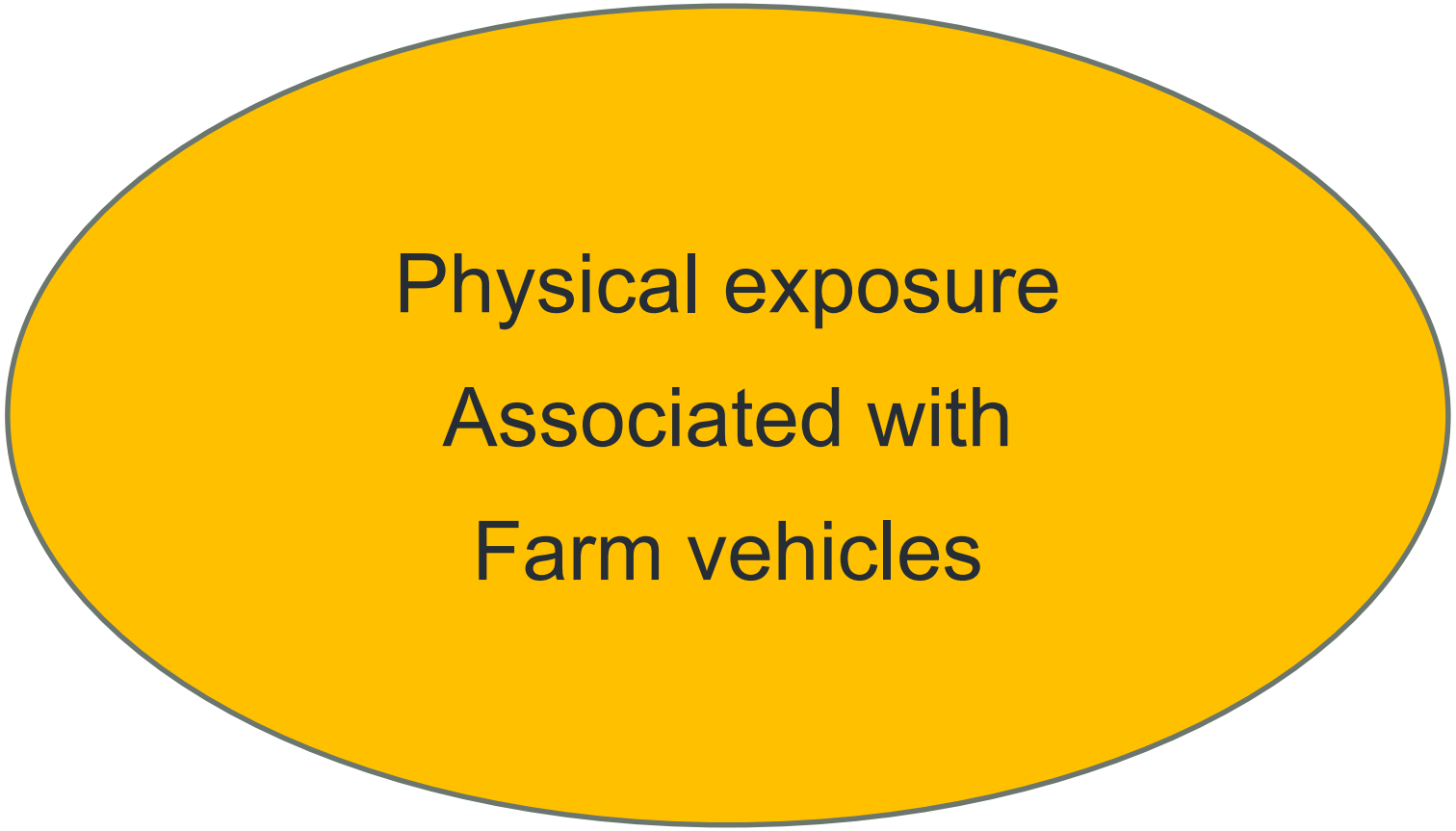
Analyzing Vibration







Mean daily vibration exposure exceeds++ ISO recommended action limits


Physical exposure
Associated with
Farm vehicles

Farming tasks

Health issues

- Low back pain/ neck pain (structural damage?)
- Falls/trips: exiting from the vehicle
  - Agriculture (Bentley et al 2005)
- Loss of control events
  - Agriculture (Milosavljevic et al 2011)

Mechanisms behind this issues?

Is Balance and postural control altered?

Quad bike driving

Disturbed postural control

Static/dynamic/functional tasks

Are there postural control changes following a period of quad bike driving? **Yes**

Field experiment

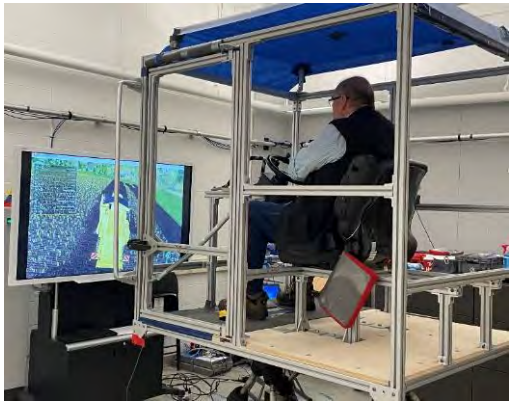
ARE THERE COGNITIVE CHANGES FROM WBV EXPOSURE?

Yes

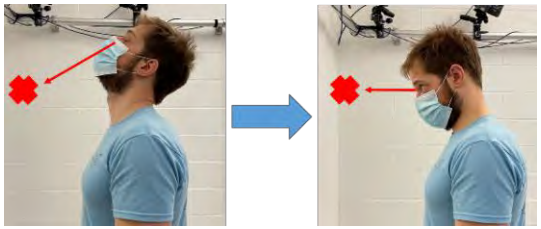
Cognitive changes (reaction time) from I hour of farm realistic vibration exposure using PVT (Psychomotor Vigilance Test)

CCRAH Ergonomics Lab

- **What activities minimize negative health effects related to WBV exposure?**
  - **5-minute intervention activity after 1h of WBV minimizes change in reaction time**
  - **Activities including GSE, walking and stretching normalized reaction time**
  - **Changes to reaction time (as a proxy for cognitive effects) a sensitive health metric of WBV exposure**
  - **Published in Annals of Medicine (Aug '23):**
  - https://doi.org/10.1080/07853890.2023.2244965



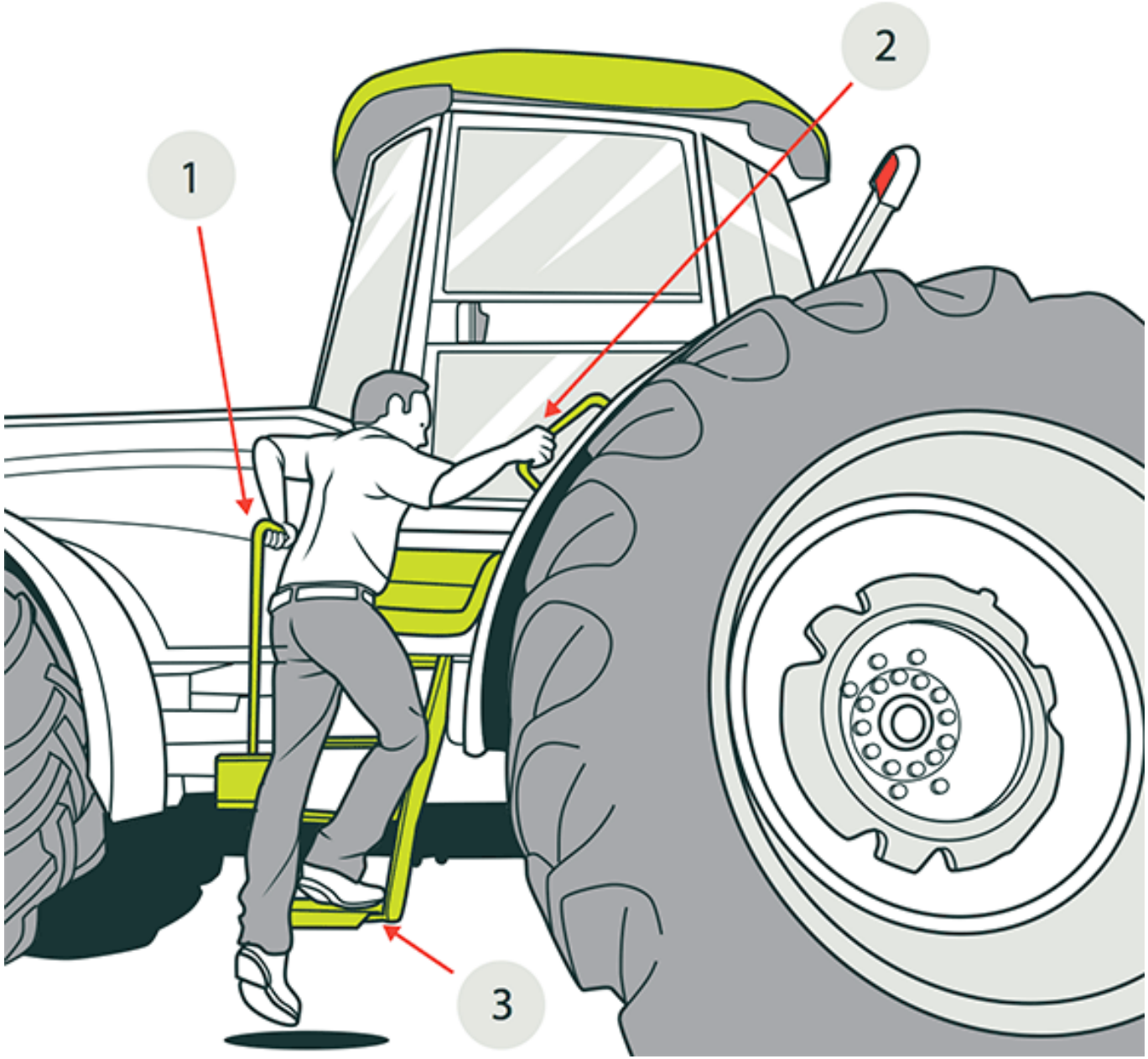
WBV Exposure on Rotopod



Gaze Stabilization Exercises (GSE)

Conclusion

- Immediate and delayed changes in postural control during lifting (intervention strategies)
- Immediate cognitive effects from resonant WBV exposure (intervention strategies)
- Caution with vehicles exit strategies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Plans

- Further Lab and field based experiments
  - Flesh out effects of various frequencies and amplitudes on postural control & cognition
  - Explore seat to head vibration transmission relative to other farm and industrial vehicles
  - Determine magnitude of cognitive changes from full working day exposure – compared to one hour in lab.
  - Work with farmers & determine how effective, feasible, and practical are intervention strategies?
  - Explore neurophysiological changes from vibration induced cognitive change in an animal model (translate results to humans)

Final thoughts.

Empowering rural workforce with knowledge and understanding of injury risk - and factors linked to such risk is important.

Pragmatic, acceptable and effective interventions for the workforce are fundamental to improving MSK health.