

Pain and Sleep Quality in UH-60 Aircrew vs Age-matched Civilians

Keri R. Hainsworth, PhD

R. Cutlan, A. Vedantam, B. Stemper

August 2026



knowledge changing life



- Keri Hainsworth, PhD has no conflicts to report
- Rachel Cutlan, BS has no conflicts to report
- Aditya Vedantam, MD has no conflicts to report
- Brian Stemper, PhD has no conflicts to report

Acknowledgements

This research was supported by the Incapacitation Prediction for Readiness in Expeditionary Domains: an Integrated Computation Tool (I-PREDICT) program supported by the Office of Naval Research (ONR) and the Department of Veterans Affairs Medical Research

I-PREDICT

Incapacitation Prediction for Readiness in Expeditionary Domains: an Integrated Computational Tool

Background and Rationale



- 67% helicopter pilots report neck pain
- 80% report back pain
- Contributing factors:
 - Helo-hunch
 - Whole-body vibration
 - Head-borne equipment
 - Helmet
 - Night Vision Goggles
- Not enough known about other factors that may cause and/or exacerbate pain.

Background and Rationale

- Sleep is known to have a strong, bi-directional relationship with pain*
- Sleep-pain relationship not well explored in military aviation medicine; this is a *missed opportunity*

GOAL: Examine nature and impact of pain and sleep in UH-60 aircrew vs. age-matched civilians.

*Kim et al. Revealing sleep and pain reciprocity with wearables and machine learning. PMID: 40335627

Methods

Participants

- UH-60 aircrew recruited for a larger study on pain in this population
- Age-matched civilians recruited as control group for two larger studies

Design

- Study design aligned with biopsychosocial definition of pain.

Self-reports – sleep and pain

Pittsburgh Sleep Quality Index

Neck Disability Index

Oswestry (low back) Disability Index

painDETECT

Central Sensitization Inventory

Pittsburgh Sleep Quality Index

Pain Catastrophizing Scale

PROMIS Anxiety

PROMIS Depressive Symptoms

Raja SN. The revised International Association for the Study of Pain definition of pain: concepts, challenges, and compromises.
PMID: 32694387

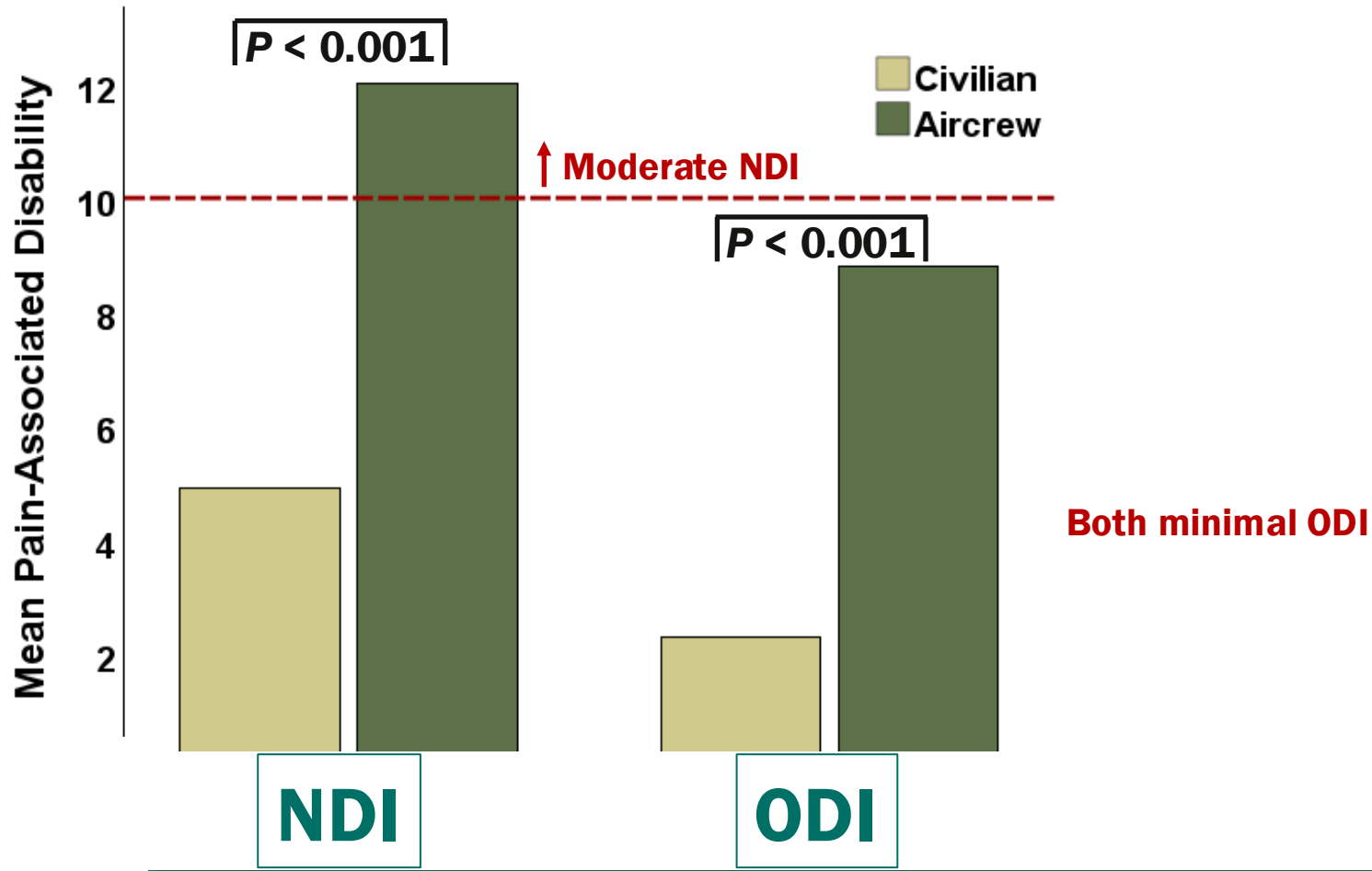
Results

Measure	UH-60 (<i>n</i> = 28)	Civilian (<i>n</i> = 20)	<i>P</i> -value
Age (yrs)	36.0 ±6.4	35.8 ± 7.7	0.889
Weight (kg)	86.8 ±12.5	88.1 ± 14.6	0.752
Height (cm)	177.8 ± 7.8	178.3 ± 8.0	0.844
BMI	27.4 ±3.0	27.6 ± 4.1	0.795
Neck circumference (mid) (cm)	39.2 ± 2.6	37.7 ± 3.6	0.235
Neck length (cm)	11.2 ± 1.1	10.9 ± 1.6	0.477

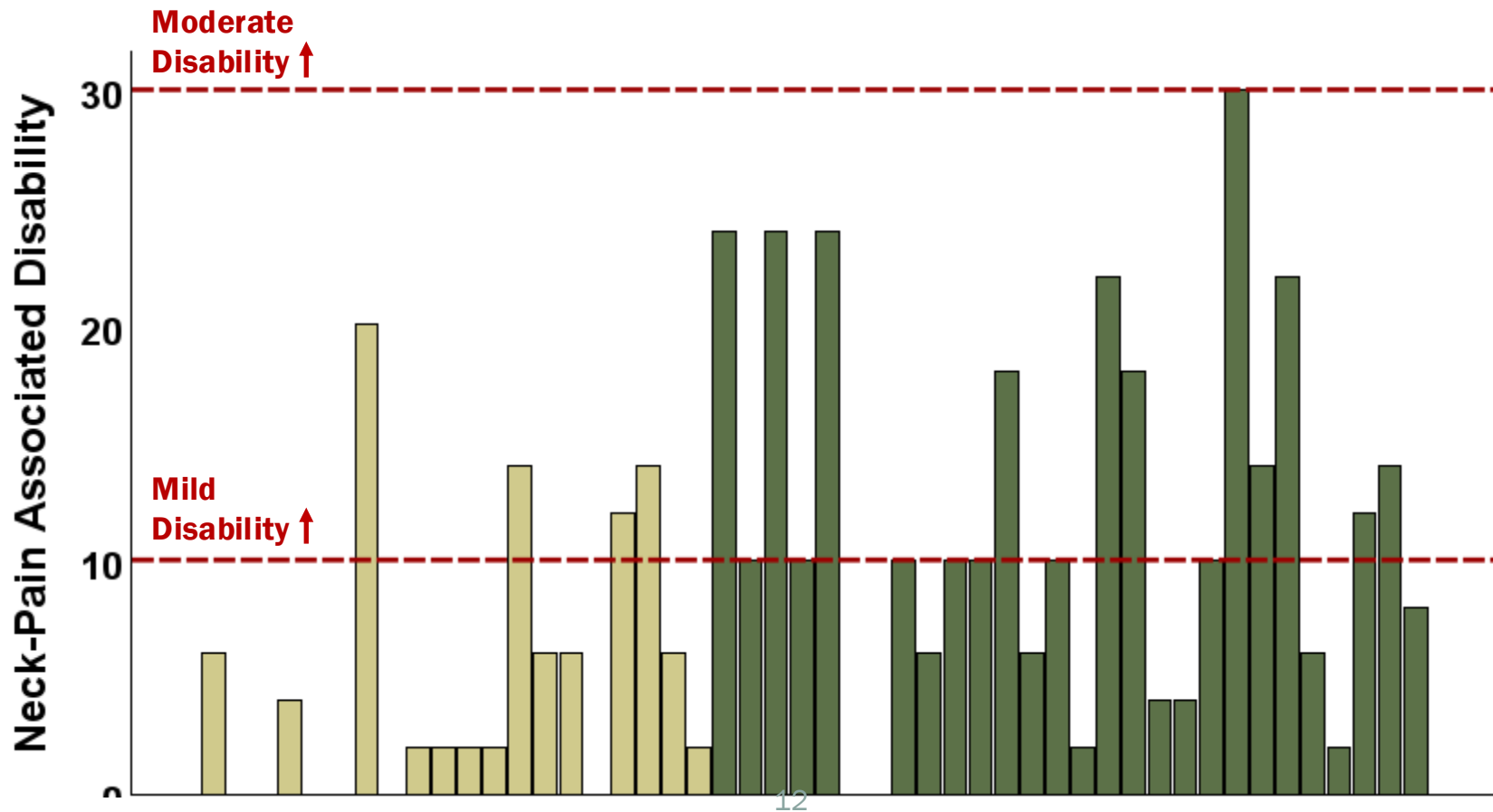
Demographics and Anthropometrics

	UH-60	Civilian
Age Group (yrs)	<i>n</i>	<i>n</i>
<35	14	8
35-39	6	6
40-44	4	2
45+	4	4

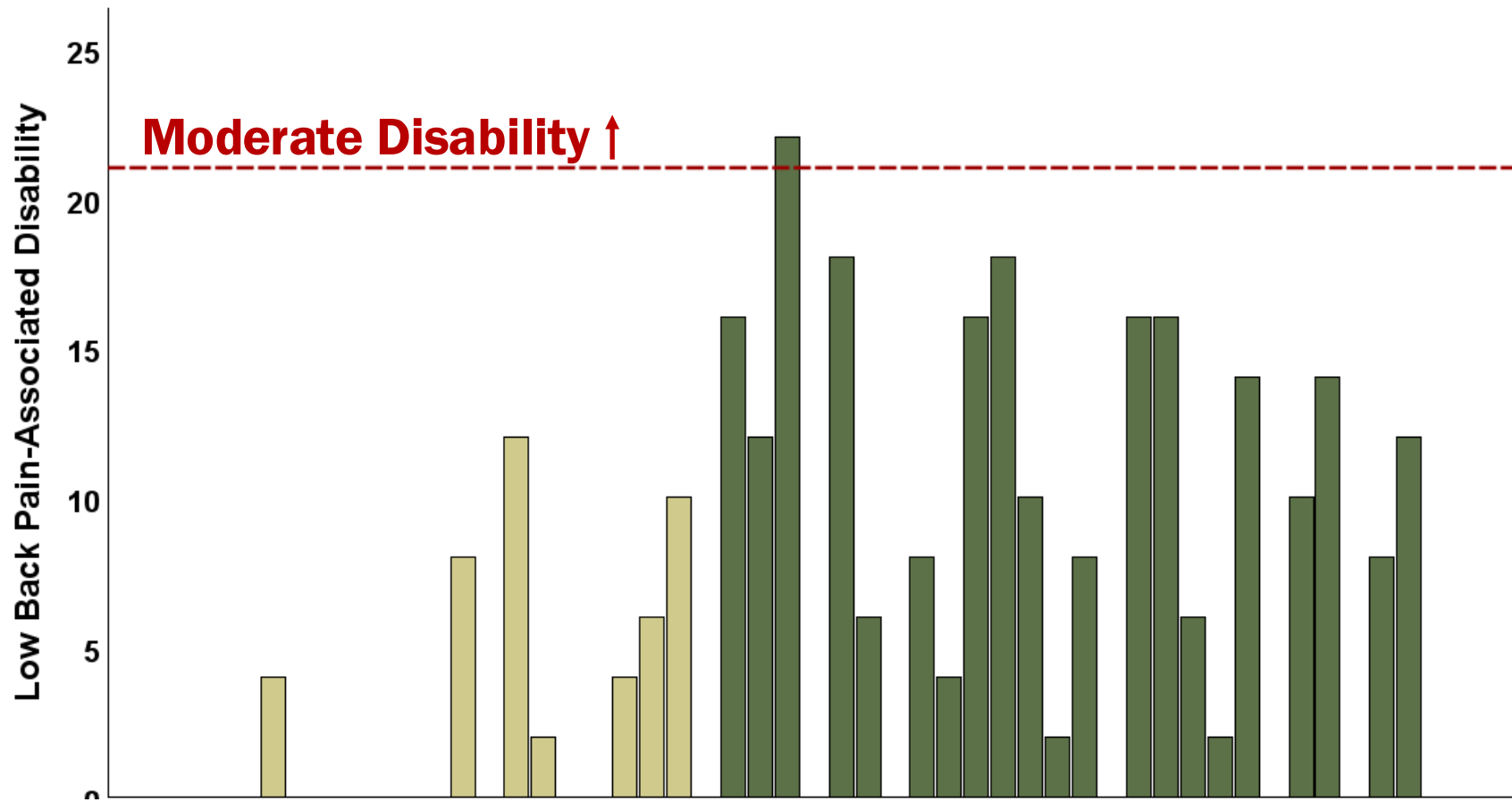
NDI/ODI: Group Comparisons



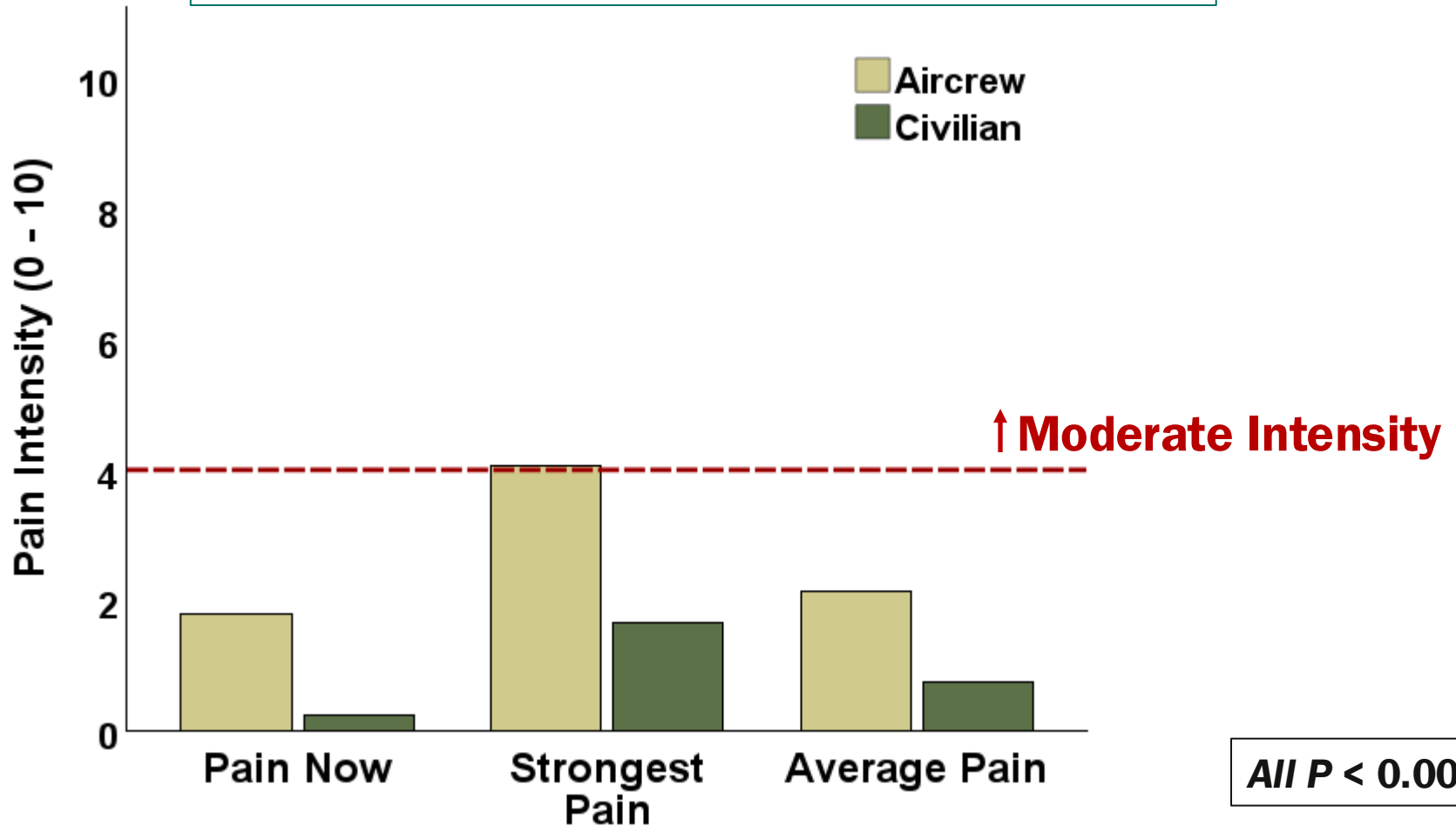
Individual NDI Scores



Individual ODI Scores



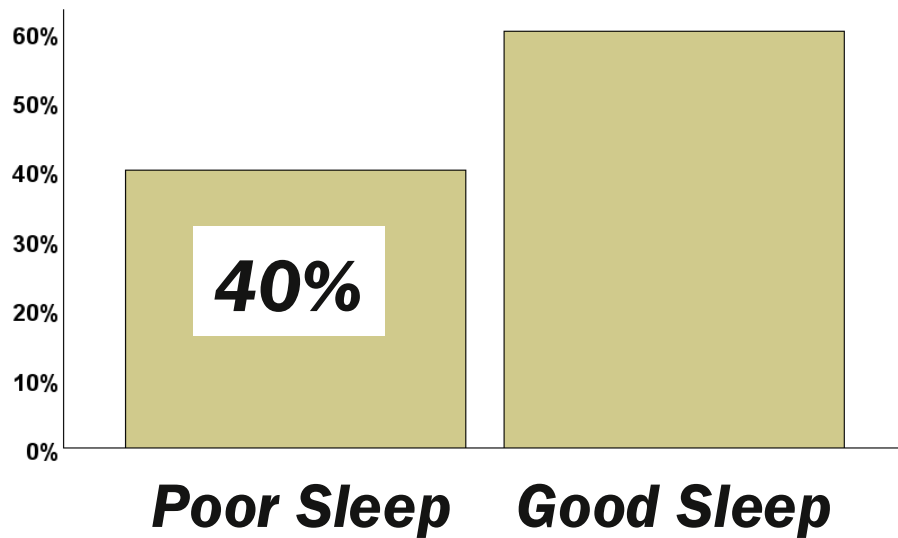
Pain Intensity: Group Comparisons



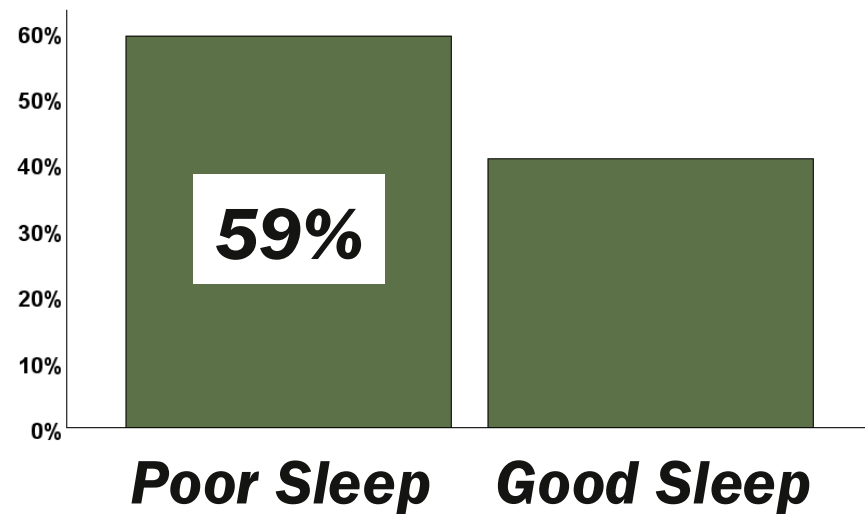
Sleep Quality: Group Comparisons

$P < 0.244$

Civilians



Aircrew



Patterns of pain-disability correlations across groups

Aircrew: Good Sleep

	NDI	ODI
Current	.48	.88
Strongest	.46	.78
Average	.52	.83

Civilian: Good Sleep

	NDI	ODI
Current	.45	.91
Strongest	.38	.67
Average	.19	.63

Aircrew: Poor Sleep

	NDI	ODI
Current	.72	.54
Strongest	.49	.54
Average	.53	.58

Civilian: Poor Sleep

	NDI	ODI
Current	.42	.78
Strongest	.70	.53
Average	.60	.64

Summary

- **When compared with civilians, aircrew report significantly worse:**
 - **Neck and low back pain-associated disability**
 - **Current, Strongest, and Average pain intensity**
- **Complicated pain-disability pattern, possibly affected by poor sleep**

Thank you

Thank You

The U.S. Air National Guard Fighter-Jet Pilots



Brian D. Stemper, PhD
Principal Investigator
Professor
Biomedical Engineering &
Neurosurgery



Lt. Col. Benjamin Gerds
Commander
115th Operations Group
Wisconsin Air National Guard



Aditya Vedantam, MD
Lead: Clinical Interpretation
Assistant Professor
Neurosurgery



Keri Hainsworth, PhD
Lead: Pain Assessments
Associate Professor
Anesthesiology



Hershel Raff, PhD
Lead: Blood & Saliva Biomarkers
Professor
Endocrinology & Molecular Medicine



Christopher Wolfla, MD
MRI Clinical Over Reads
Professor
Neurosurgery



L. Tugan Muftuler, PhD
Lead: Medical Imaging
Professor
Neurosurgery



Narayan Yoganandan, PhD
Lead: Injury Biomechanics
Professor
Neurosurgery



Timothy Meier, PhD
MRI
Blood Biomarkers
Professor Neurosurgery

Amy Nader
Study Coordinator

Keeley Hamill
Clinical Research Assistant

Rachel Cutlan
BME Graduate Student

Cory Everts
Functional Assessments

Katherine Sherman, MS
Biostatistician

The 2020 revised definition of pain is:

“An unpleasant sensory and emotional experience associated with, or resembling that associated with, actual or potential tissue damage,”

- Personal experience and always Bio-psycho-social.
- Pain and nociception are different phenomena. Pain cannot be inferred solely from activity in sensory neurons.
- A person's report of an experience as pain should be respected.
- Although pain usually serves an adaptive role, it may have adverse effects on function and social and psychological well-being.

Acute

- Caused by injury or illness
- Goes away as soon as an injury heals
- Useful, protective, signals an injury
- Causes brief disruption to life
- Taking it easy helps recovery

Chronic

- May start out as acute pain after illness or injury
- Pain persists after healing and lasts longer than expected
- Not useful or protective. Pain signal no longer caused by injury (in certain cases)
- Pain duration causes more disruption in life
- Taking it easy can make the problem worse