GRIP LAB AI : ENHANCING SMARTWATCH AND WEARABLE DEVICE ACCURACY FOR IMPROVED HEALTH RECOMMENDATIONS, ATHLETIC PERFORMANCE, AND INJURY PREVENTION

SPONSOR - DAN BANAS, GRIP LAB AI FOUNDER/CEO

AUTHORS

Shardul Dhananjay Suryavanshi, Omkar Mahesh Pallerla, Vinit Vijaykumar Adke, Pavithran Manoharan, Mihir Khandelwal, Pei-Wen Chen, Wei-Cheng Fan

AFFILIATIONS

ASU W. P. Carey School of Business Arizona State University

GRIP LAB AI

ABSTRACT

The elite wearable market (eg-Oura, Whoop) faces a critical blind spot: current algorithms rely on Physiological factors to measure biological stress but fail to capture Neuromuscular Fatigue, the actual capacity of the Central Nervous System (CNS) to perform work.

The Grip Lab AI Solution: We validated isometric grip strength as a scalable, low-friction biometric to bridge this gap. By integrating proprietary "Asymmetry Penalties" and prioritizing non-dominant hand data, our model significantly upgrades standard recovery algorithms. This project confirms that a affordable hardware integration can deliver "Recovery 2.0", a more holistic, accurate, and commercially viable readiness score.

DEVICES

SMART DEVICES

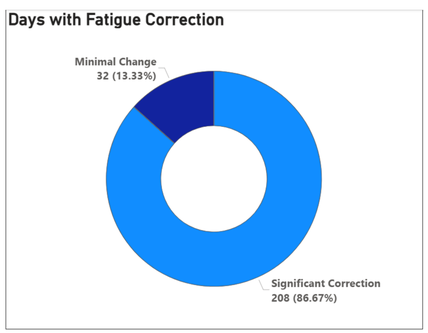
GRIP STRENGTH DEVICES

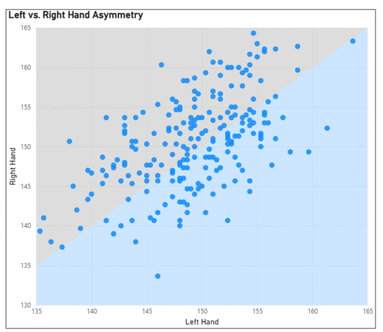
THE MARKET PROBLEM

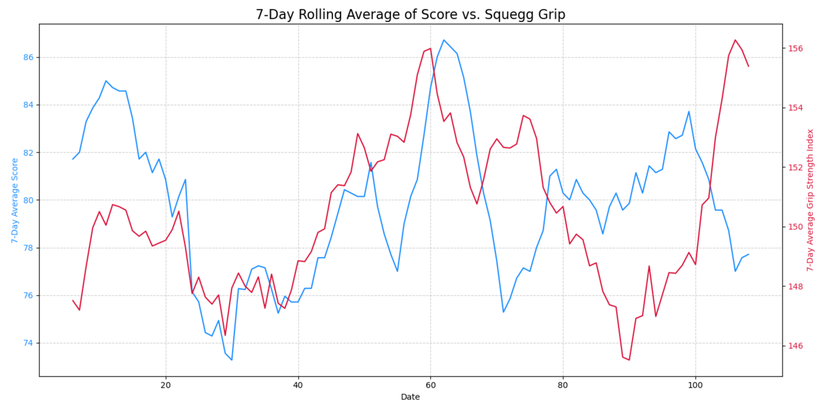
The Customer Pain Point: Athletes constantly ask, "Am I ready to perform today?" Current wearables answer this using only Physiological data (eg-HRV, Sleep-time etc). This reflects internal stress but ignores muscular capability, leading to inaccurate "Green" scores on days of high neural fatigue.

The Missing Link: There is no scalable, direct measure of CNS Fatigue in current consumer algorithms.

Our Hypothesis: We tested if simple grip dynamometers could serve as a proxy for CNS readiness, providing a cleaner signal of fatigue than Physiological factors alone.







VALUE PROPOSITION

Product Validation: The "Grip Lab AI" project investigates the viability of integrating grip metrics into wearable ecosystems to:

1. Enhance the accuracy of daily "Readiness/Recovery Scores".
2. Create a competitive moat by measuring Neuromuscular Drive (a feature competitors lack).

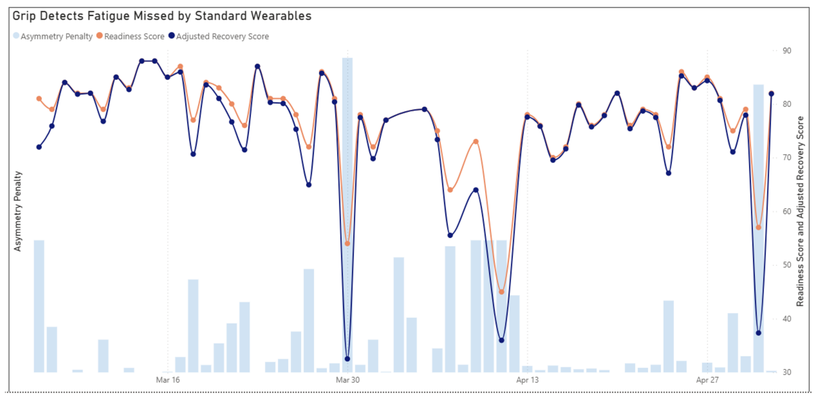
METHODS

Hardware Scalability:

- Smart Wearables used: Oura Ring (Gen 3), Whoop (4.0).
- Grip Strength Devices used: Compared affordable smart tools (Squegg) vs. expensive clinical tools (Jamar) to validate commercial viability.

Modeling:

- Input: Daily biometrics from the smart wearables + Grip Strength (Left vs. Right) from grip measuring devices.
- Engine: XGBoost and Random Forest models designed to isolate "Hand Dominance" as a predictive feature.
- Feature Engineering: Developed "Asymmetry Indices" to quantify neuromuscular disconnection.



DISCUSSION

Interpretation: Recovery is not a single metric. It is a balance of two systems: Biological and Mechanical factors. When these diverge, smart wearables fail.

The Asymmetry Penalty (Proprietary Logic): Our research proposes a new logic layer:

- Base Score: HRV,Sleep-time etc (Current Standard).
- The Adjustment: If Grip Asymmetry > Threshold, apply a "Neural Penalty."
- Result: A dynamic score that reacts to neural fatigue even when Physiological factors remains stable.

Implications: Future wearables can incorporate active testing (e.g., a "Morning Squeeze" feature) to calibrate passive sleep data, increasing user engagement and data accuracy.

CONCLUSION

Grip is a Valid Business Metric: It successfully captures the fatigue that current smart wearables miss, offering a tangible upgrade to current algorithms.

"Test the Weak Side": For scalable deployment, data from the Non-Dominant Hand provides the cleanest signal, simplifying the user protocol.

Target Audience: High-load athletes (Climbers, Lifters, Crossfit, Golfers) require this asymmetry analysis to prevent injury, a high-value niche for premium tiers.

NEXT STEPS

IP Strategy:

- Patent Pending: Currently holding Provisional Patent; moving towards Utility Patent for the algorithm.

Go-to-Market:

- B2B Licensing: Partner with hardware manufacturers (Oura, Garmin, Eight Sleep) to license the Grip Lab AI algorithm as an API integration.
- Validation: Expanding pilot studies with university sports teams to further validate the model for mass-market adoption.