



NeuRelief

**The First AI-Powered Objective Pain Scale
and Proactive Neuromodulation System**

NeuRelief starts with migraines, but scales into an AI-driven pain revolution integrating precision and personalized medicine.



Meet the NeuRelief Team



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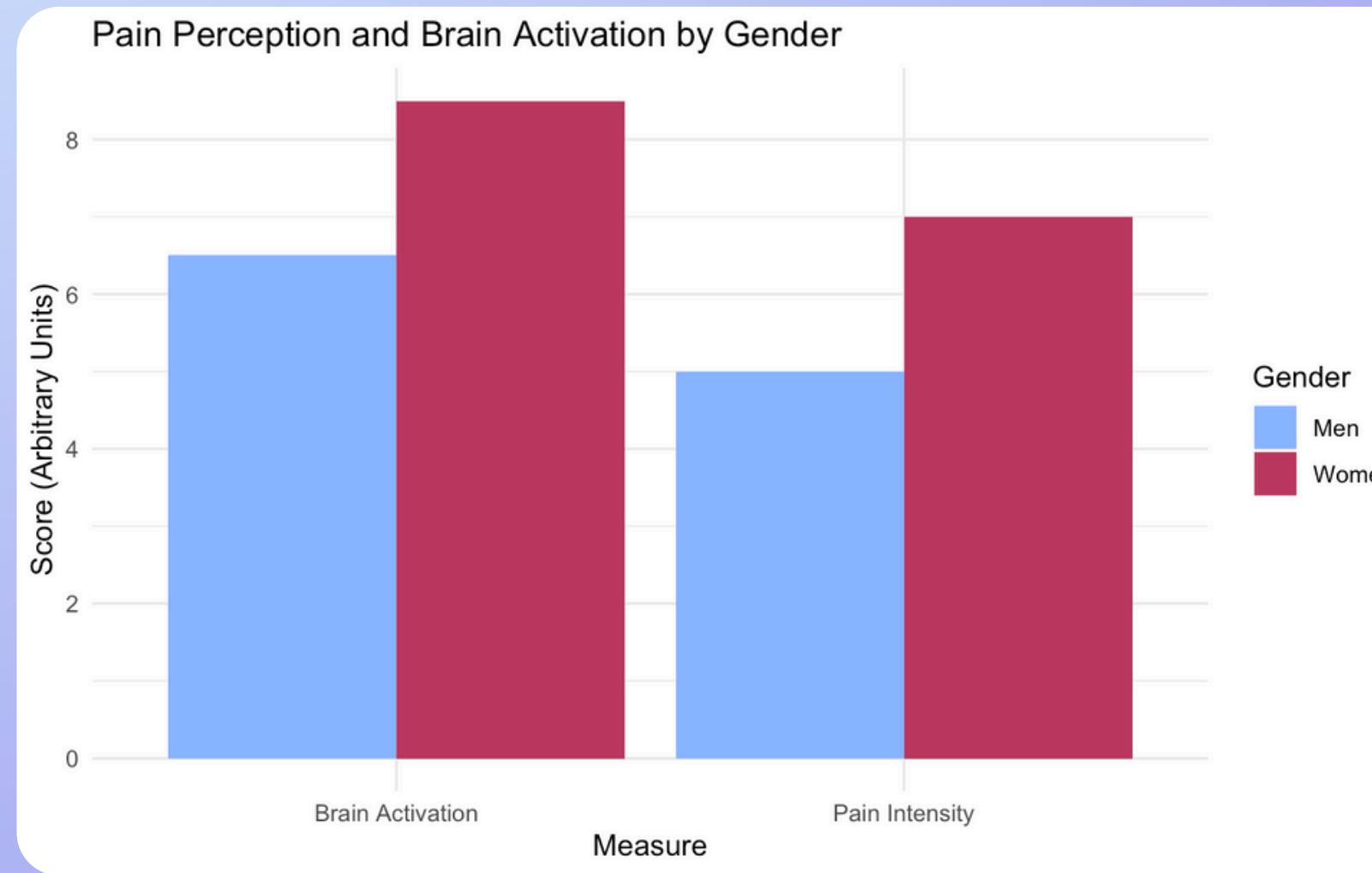
New York University
Data Science
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The Problem

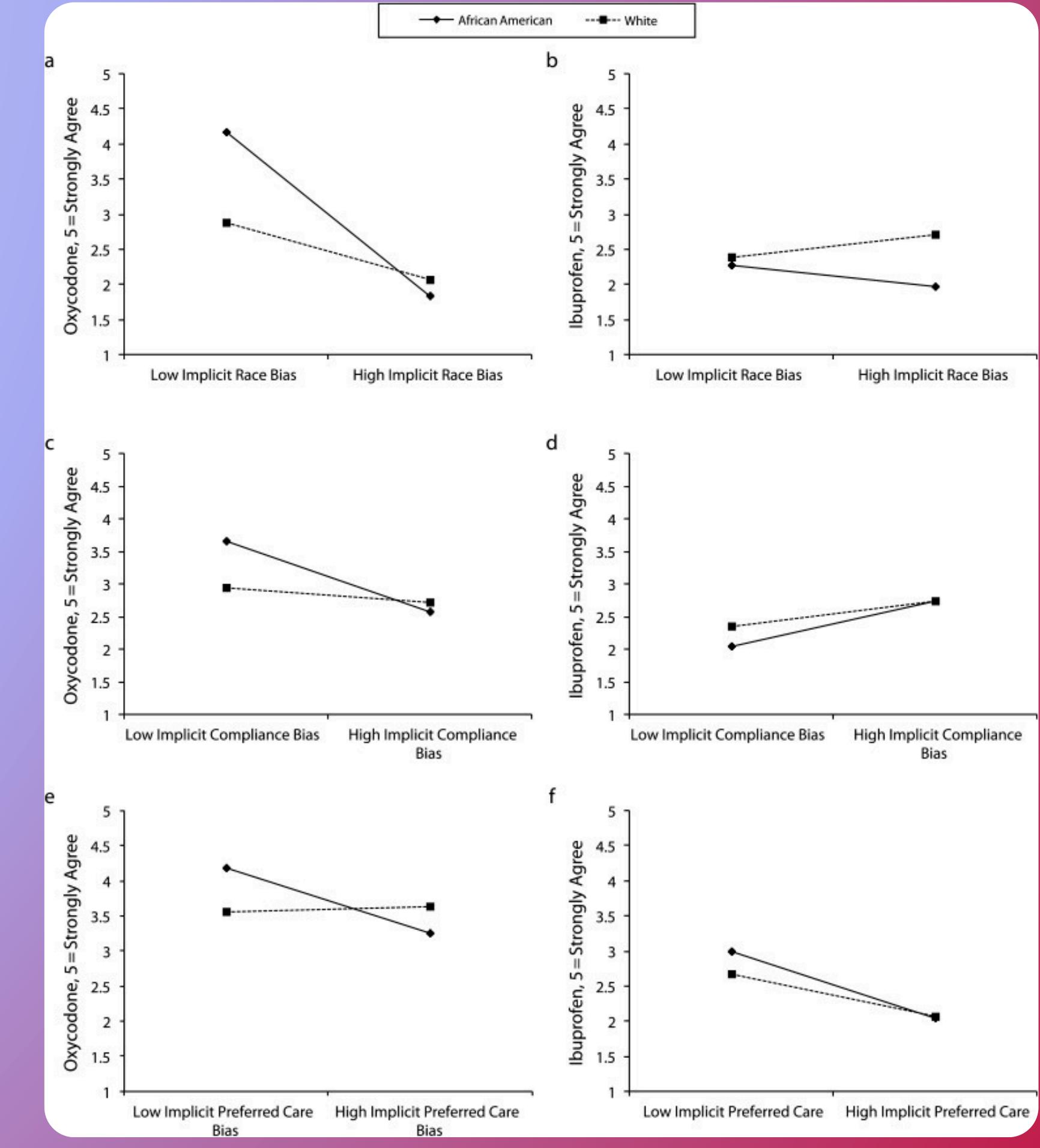
- 50 million adults in the U.S. suffer from chronic pain, with 20 million experiencing high-impact pain that limits daily activities
- 1 in 3 chronic pain patients rely on opioids, contributing to the opioid crisis, which caused over 80,000 overdose deaths in 2021
- Non-personalized treatments result in ineffective pain relief for up to 40% of patients
- A \$635 billion economic burden annually (higher than cancer, diabetes, and heart disease combined)

Demographics: Pain Perception and Treatment Disparities

Gender (left) & Race (right)



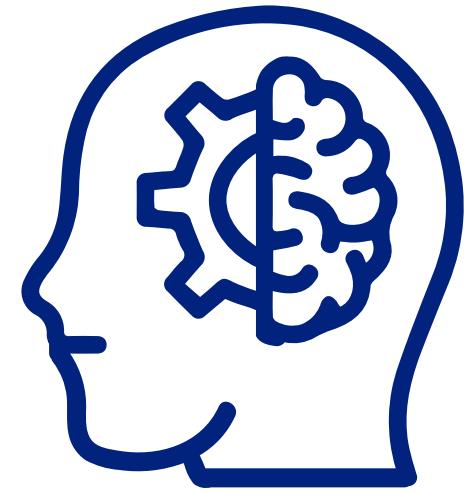
<https://onlinelibrary.wiley.com/doi/10.1111/j.1553-2712.2008.00100.x>



<https://pubmed.ncbi.nlm.nih.gov/22420817/>

Need for Objective Pain Index

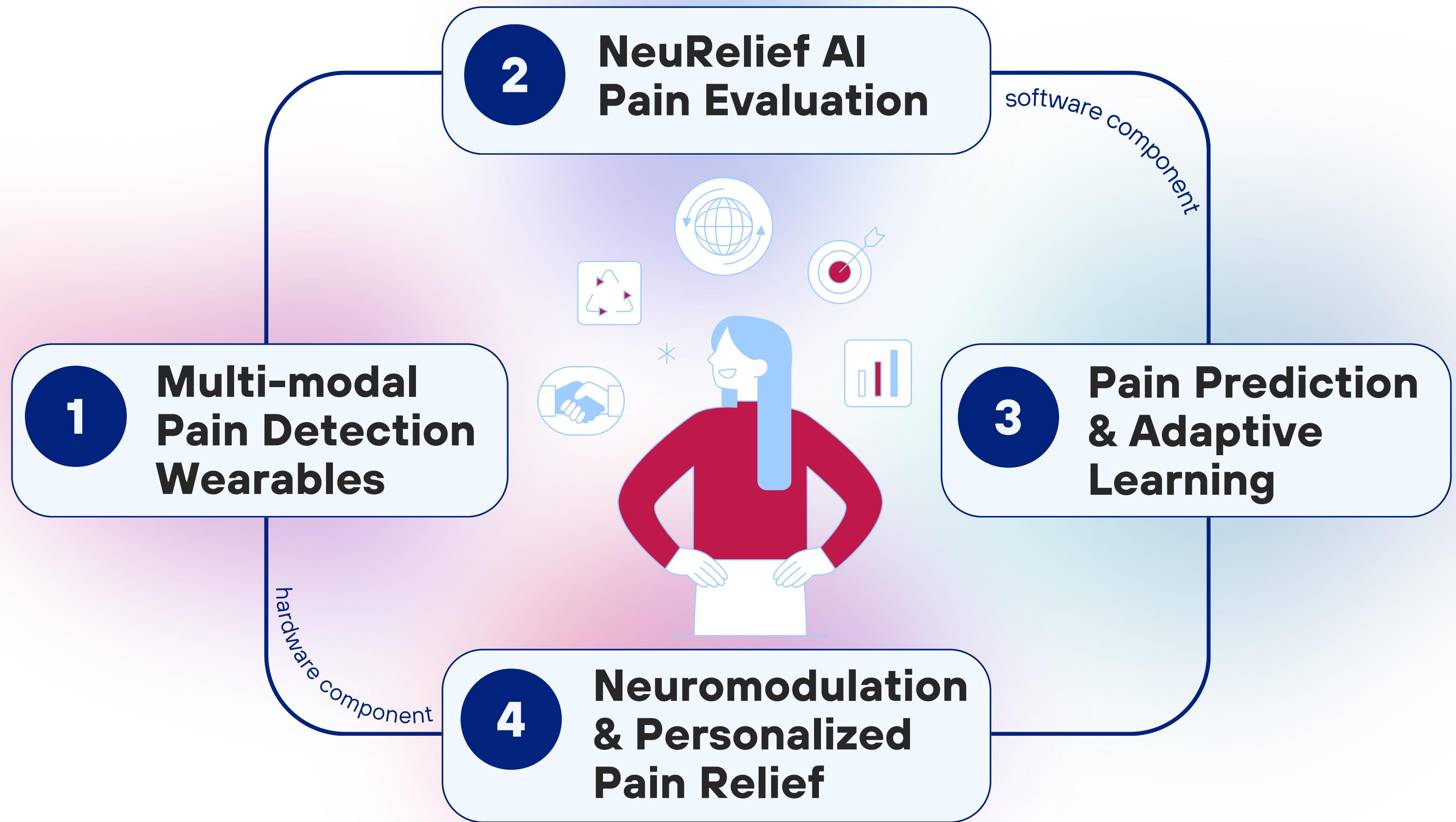
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- **Standardized Research & Trials:** Creates reliable, quantifiable pain metrics to improve clinical studies and drug development.
 - **Eliminates Bias & Disparities:** Ensures equal pain assessment across gender, race, and socio-economic backgrounds.
 - **Improved Diagnosis & Treatment:** Replaces subjective reporting with precise, AI-driven pain measurement for better medical decisions.
 - **Reduces Opioid Dependency:** Enables targeted, non-pharmacological pain management, lowering reliance on addictive medications.
 - **Healthcare & Cost Efficiency:** Streamlines treatments, reduces misdiagnoses, and optimizes resource allocation.



Introducing NeuRelief

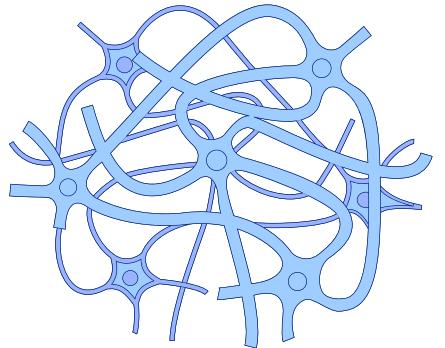
**Closed Loop AI-Powered Pain Relief: Precision
Pain Classification & Personalized Pain Modulation**

NeuRelief transforms pain management with AI-driven precision, replacing estimation with data to personalize treatment, reduce opioid reliance, and unlock a multi-billion-dollar market in healthcare and consumer wellness.



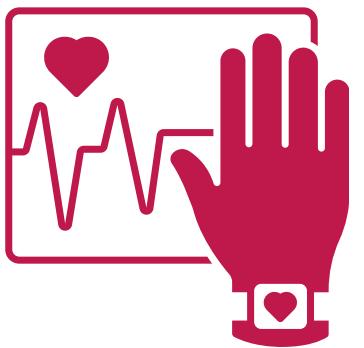
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Multi-modal Pain Detection



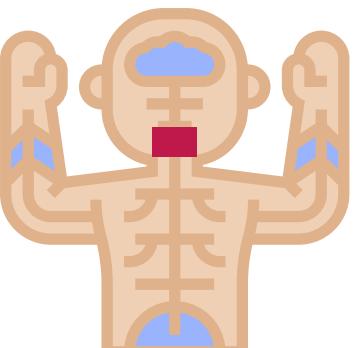
The Science

"Due to the subjectivity and complexity of pain, no single biomarker can fully capture all its facets" (Xing, Yantao et al.). The NeuRelief pain evaluation algorithm (PEA) requires several data types to make an informed treatment plan personalized to each patient.



Bio-electronic Wearables: The Product Line

Starting with a headband, the NeuRelief product line will expand to several wearable formats, including topical patches for body-centric pain (pelvis, back, post-surgical, breast-tenderness, etc) and wearable wrist straps for extremity pain (athletic injury, carpal tunnel, arthritis) to record pain by tracking HRV, temperature, inflammation via oxygen sensation, and electrical activity of pain receptors (nociceptors) local to each wearable.



Spinal Cord & Biomarkers

Pain is strongly correlated with psychological and physiological stress, both of which are observable and recordable via the vagus nerve. Because bodily pain is transmitted through the spinal cord, a topical patch wearable is placed at the back of the neck to cross-reference pain and vagal activity for enhanced assessment.

NeuRelief AI Pain Evaluation

Once multimodal pain biomarkers are collected, NeuraLief's AI model assigns an **objective Pain Index Score (0-100)** and records the pain every hour, along with user's self-report.

- AI normalizes raw sensor data (EEG frequencies, HRV variability, EMG signals).
- Identifies patterns associated with pain (e.g., increased theta/beta EEG power, HRV drop).
- Learns from Patient Self-Report to assess the impact of pain perception.
- Uses a pre-trained machine learning models (e.g., CNN, LSTM, & Graph Neural Networks) to classify pain intensity & location based on sensor inputs **before** pain reaches the brain.

3

Pain Prediction & Adaptive Learning

AI tracks historical pain scores and changes in biomarkers that typically precede onsets of high pain scores to **intervene prior to pain and deliver personalized treatment.**

This algorithm is initially trained from large, open-source data from OpenNeuro & PhysioNet and adapts to patient's bioelectronic data & self-report, minimizing the time required for the software to learn.

Pain Score	Experience & Treatment
0-20	Relaxed state, little to no pain
20-40	Light discomfort, light intervention.
40-60	Moderate pain, moderate intervention.
60-80	Significant pain, significant intervention.
80-100	Emergency contact & treatment.

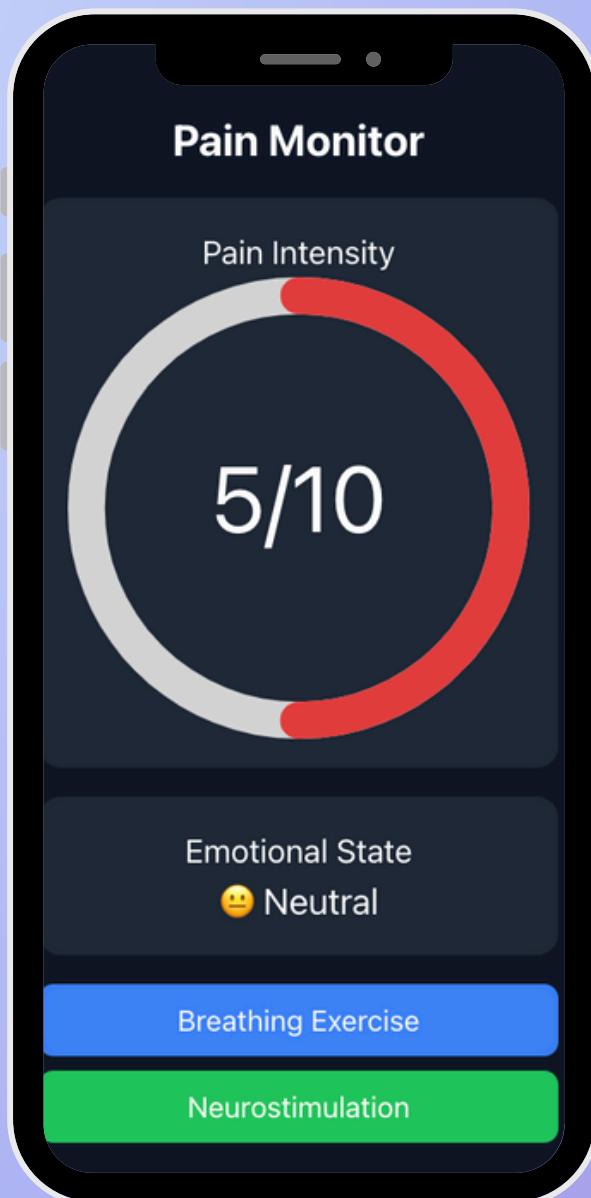
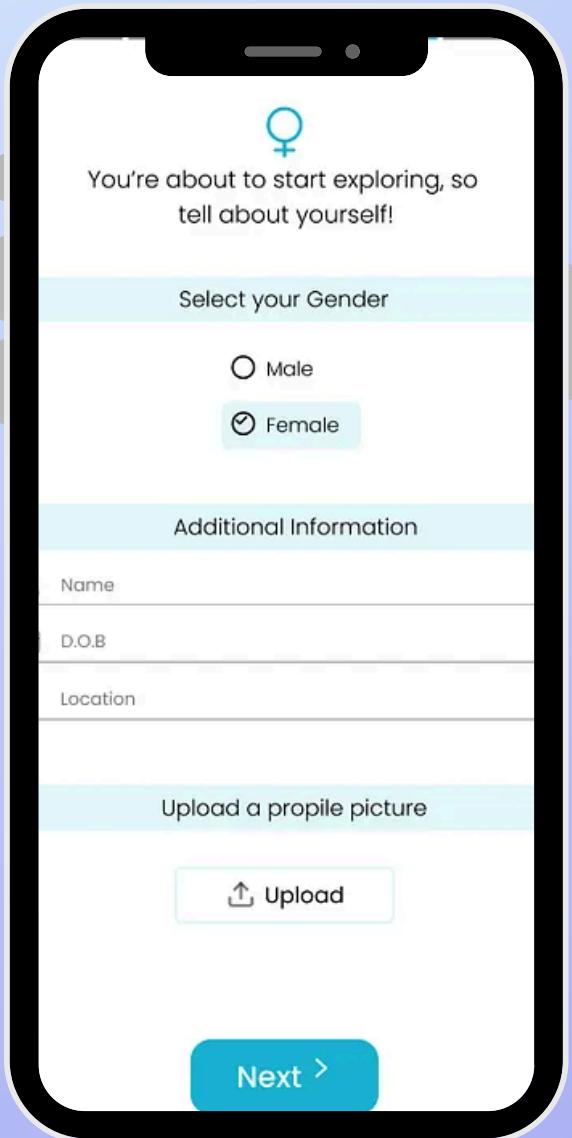
Neuromodulation: Personalized Pain Relief

The International Neuromodulation Society defines therapeutic neuromodulation as "the alteration of nerve activity through targeted delivery of a stimulus, such as electrical stimulation or chemical agents, to specific neurological sites in the body."

- ✓ The NeuRelief deep learning and user interface tailors neuromodulation therapy to the patient's immediate and longterm needs.
- ✓ Uses Electroconvulsive therapy, repetitive transcranial magnetic stimulation, and vagus nerve stimulation, **all FDA approved brain stimulation therapies for pain.**
- ✓ Initial therapeutic device will resemble existing neuromodulating headbands & headphones, but our **prevention & intervention** algorithms set us apart.

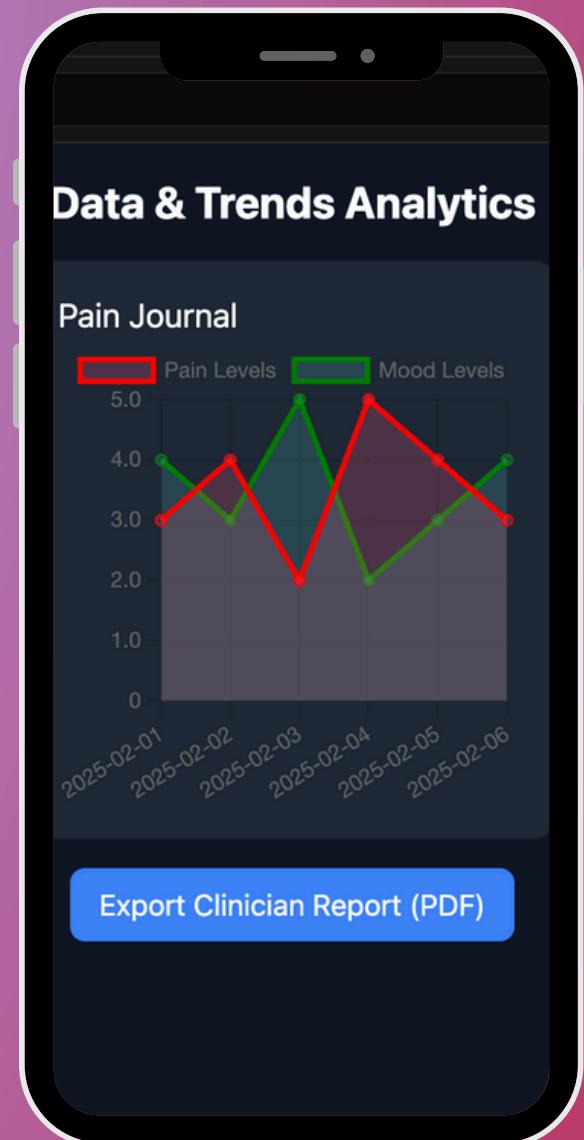
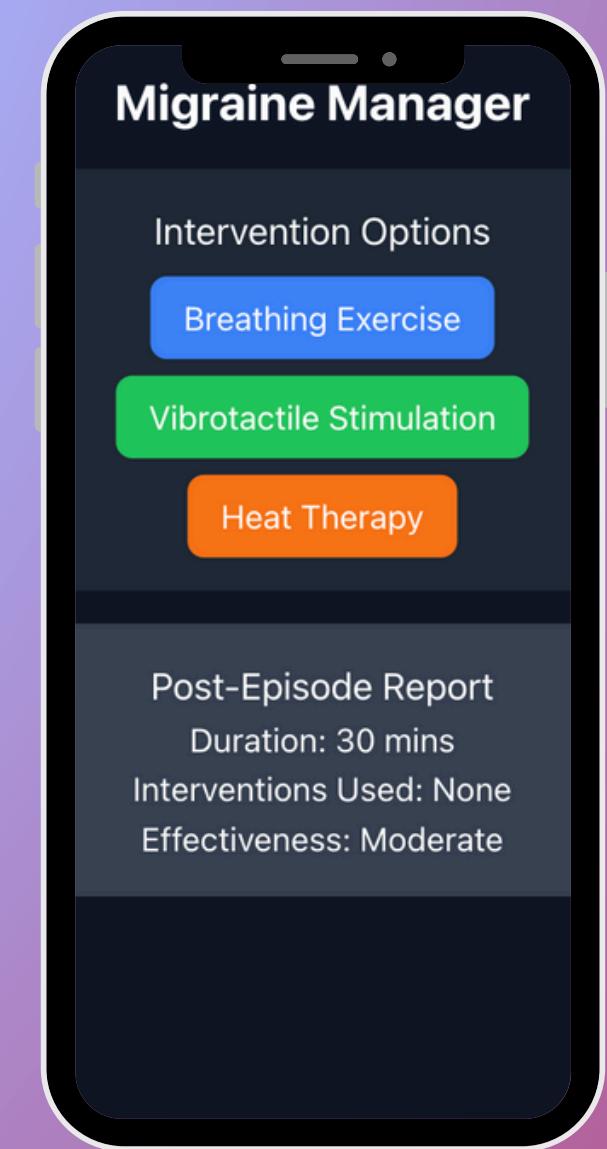


Onboarding & Profile Setup Screens



Real-Time Pain Monitoring Dashboard

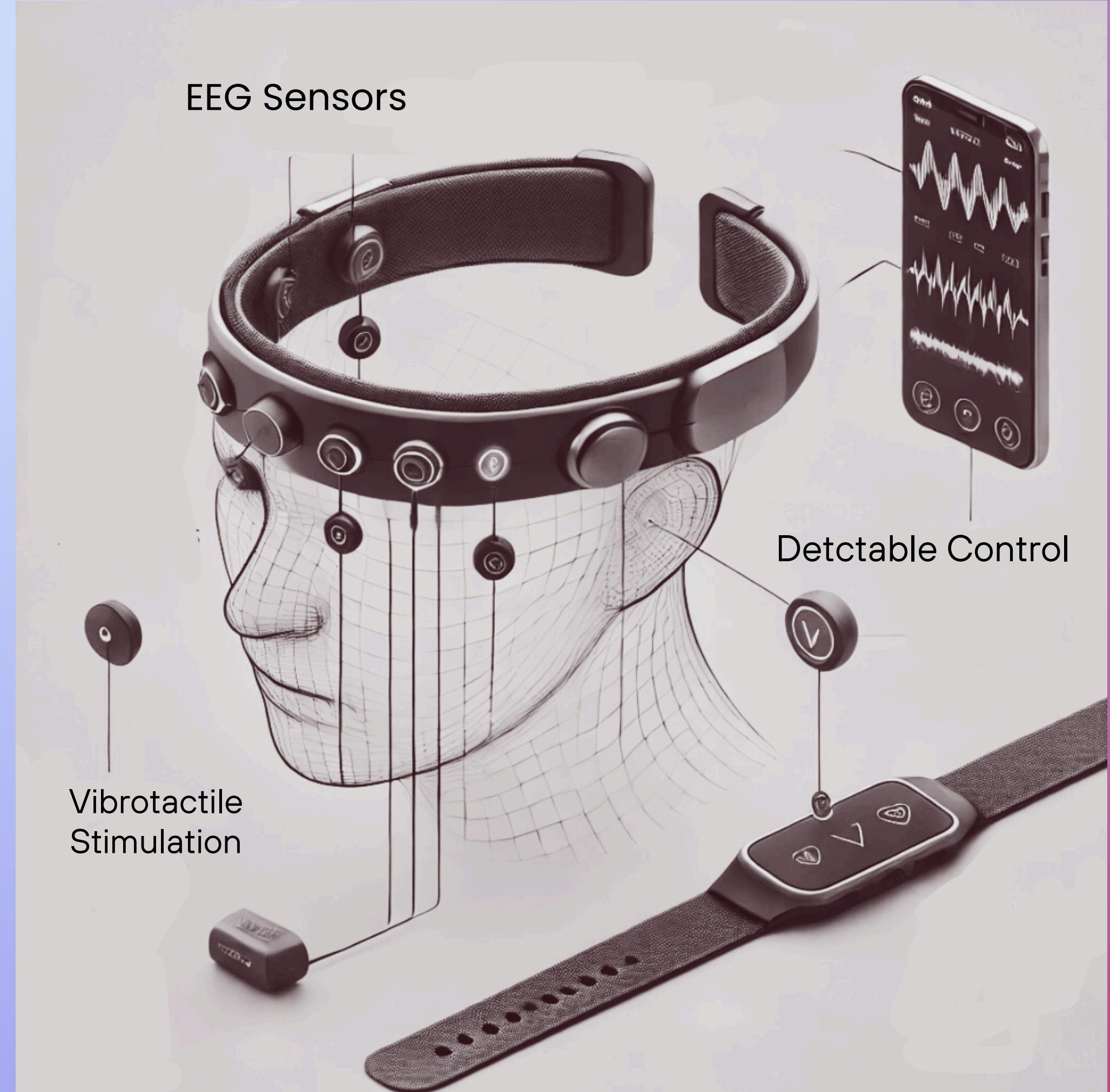
Pain Episode Management (Example: Migraine)



Data & Trends Analytics



NeuRelief



Business Model: The Trifecta



B2G

Government subsidy: NeuRelief's software for hospitals, research institutions, and Medicare/Medicaid patients.

ARPA-H or HHS Innovation **Grants** might fund nationwide deployment.

CRADA: NIH helps refine the tech while NeuRelief retains commercialization rights.

Exclusive Licensing: NIH/other federal agency licenses the technology from NeuRelief for government and clinical use.



B2B

Hospital/Enterprise SaaS Licensing (an annual fee for AI pain tracking software; **Hardware Device Sales** Clinics purchase devices for pain therapy.

Partnerships with research labs to integrate NeuRelief into studies.

Pharma companies pay for access to NeuRelief's datasets.

Joint R&D contracts → Collaborate on AI-powered pain management solutions.



B2C

Initial Use Case: **Migraine Relief**

- 1 billion people worldwide suffer from migraines.
- 40% of migraine sufferers don't respond well to medication.

Consumer Device Price: \$800 - \$1,200 (Comparable to an iPhone)

Software Subscription: \$12/mo for AI-driven pain tracking + insights

Insurance & HSA/FSA Eligibility: Partial coverage for clinical use upon approval/MD recommendation



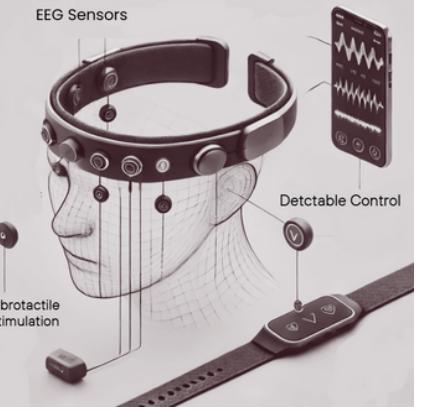
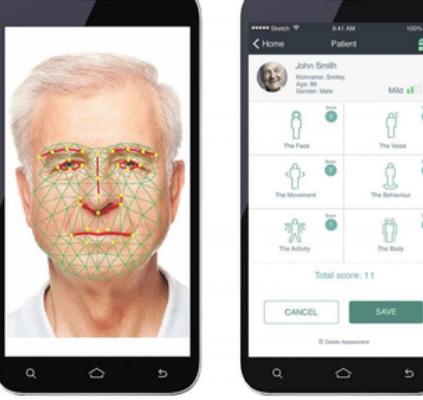
Timeline to Market & Scaling



Phase	Milestones	Timeframe
1	R&D + AI Model Training (EEG & HRV for migraine pain)	Year 1
2	Clinical Trials & FDA Approval for Neuromodulation; Software Grant/Contract for Research (B2B & B2G)	Year 2-3
3	Consumer Launch + Direct Sales	Year 3-4
4	R&D + AI Training & Trials (expansion into other conditions, including chronic pain)	Year 4-5
5	Consumer Launch + Market Domination for Pain Modulation	Year 6+

Competitor Analysis



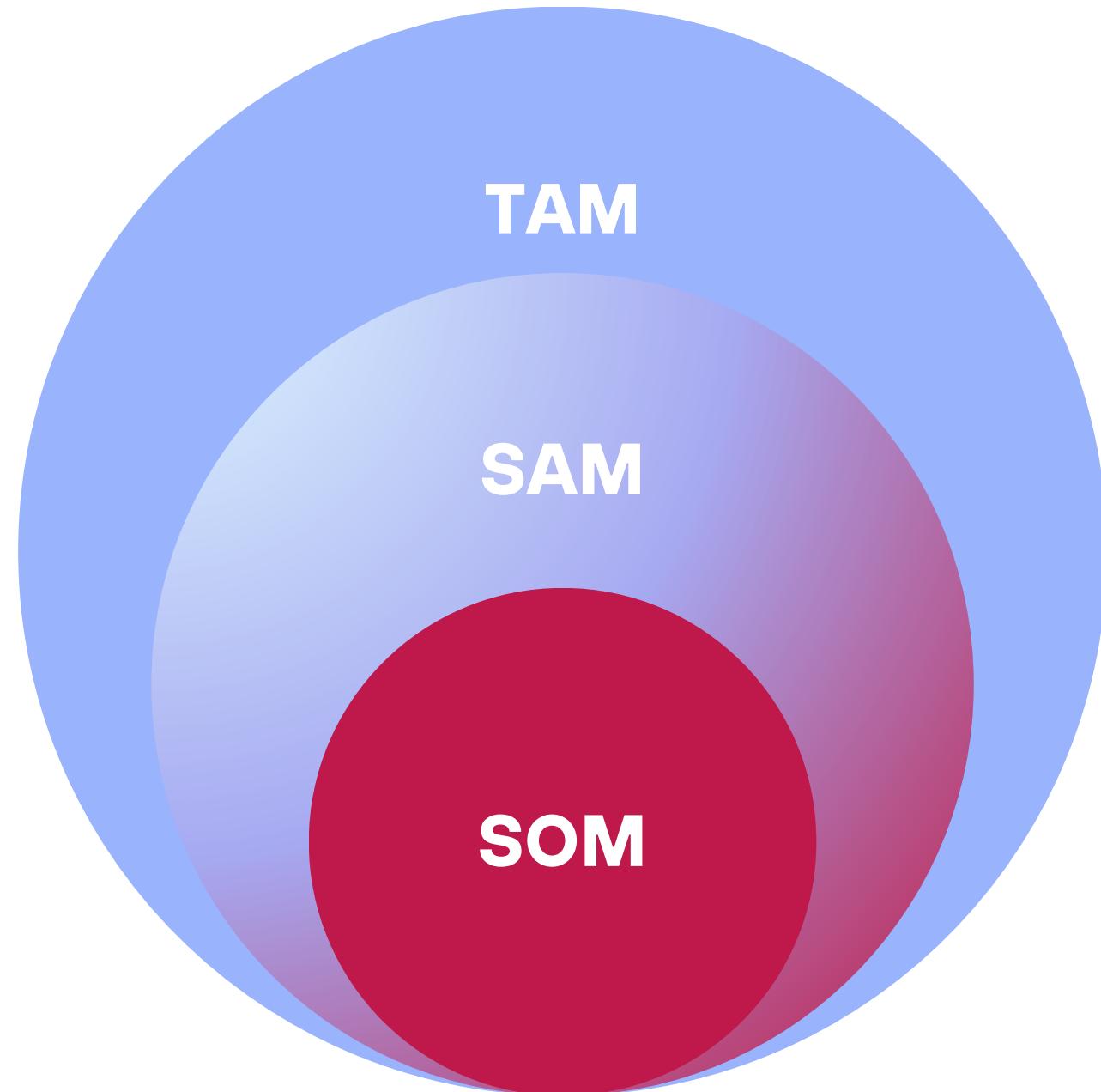
Feature	 NeuRelief	 PainTrace®	 PainChek Intelligent Pain Assessment	 biobeat Medical Smartmonitoring
Chronic and Acute Pain				
Differentiation of Pain Types	✓	✓	✓	✓
Detection of Hidden Pain	✓			
Objective Pain Index	✓			

Competitor Analysis



Market Size

- ✓ TAM:
Chronic Pain Market worth \$115.51 Billion by 2031
- ✓ SAM:
The Global Neuropathic Pain Market is estimated to be valued at US\$ 12.23 Billion in 2031
- ✓ SOM:
Global Migraine Market Size is 5.44 Billion in 2031



B2C Financials

Revenue



\$1.5m/year

Anticipated 1st year revenue
after launch



\$2.42m/year

Anticipated 5th revenue after
launch

Cost



\$1.65m

Anticipated initial startup costs



\$2.08m/year

Anticipated recurring yearly
expenses after launch



\$888k/year

Anticipated yearly expenses after
five years



NeuRelief

INVEST IN THE PAIN MANAGEMENT
REVOLUTION

Hacking Health 2025

Reserve Slides

Sales Strategy	Monthly Customers (First 6 Months)	Monthly Customers (Next 6 Months)	Total First-Year Customers	Total Revenue (1st Year)	Year 5 Revenue (10% CAGR)
Organic Growth (Word-of-Mouth, Low Ads)	10–50	50–100	360–900	\$360K–\$900K	\$580K – \$1.45M
Moderate Growth (Paid Ads + Some B2B Deals)	50–200	200–500	1,500–4,200	\$1.5M–\$4.2M	\$2.42M – \$6.76M
Aggressive Growth (Heavy B2B + Strong Marketing)	200–500	500–1,000	4,200–9,000	\$4.2M–\$9M	\$6.76M – \$14.49M

Reserve Slides

Year 0 Expenses					
2 developers*contractor		50000			
2 testers*contractor		50000			
1 designer*contractor		10000			
Company registration		1000			
Clinical trial		1000000			
Regulatory consulting		100000			
FDA filing fee-PMA approval		442000			
Total		1653000			
Type	Re-Ocurring Expenses	Monthly Amount	Type-5th year	Re-Ocurring Expenses	Monthly Amount
Direct Labor	Data analyst*2	24000	Direct Labor	Data analyst*2	24000
Direct Labor	Sales*2	14000	Direct Labor	Sales*2	14000
Direct Labor	Operation	6000	Direct Labor	Operation	6000
Indirect Labor	Compliance	6000	Indirect Labor	Compliance	6000
Indirect Labor	Accounting*Part time	3000	Indirect Labor	Accounting*Part time	3000
Direct Cost	Manufacturing(\$500*100)	50000	Direct Cost	Server and hosting fee(Website and App)	500
Direct Cost	Supply Chain(\$300*100)	30000	Direct Cost	Domain name	2
Direct Cost	Server and hosting fee(Website and App)	500	Indirect Cost	Office Expenses (PO Box, Business Accounts)	300
Direct Cost	Domain name	2	Indirect Cost	Business Insurance	200
Indirect Cost	Office Expenses (PO Box, Business Accounts)	300	Indirect Cost	Algorithm maintenance	10000
Indirect Cost	Business Insurance	200	Indirect Cost	Equipment maintenance	10000
Indirect Cost	Marketing	20000	Total Monthly Expenses		74002
Indirect Cost	Algorithm maintenance	10000	Yearly Expenses		888024
Indirect Cost	Equipment maintenance	10000			
Total Monthly Expenses		174002			
Yearly Expenses		2088024			