

Resonova

A Wearable Stochastic Resonance + Thermal Therapy Device for Dysmenorrhea

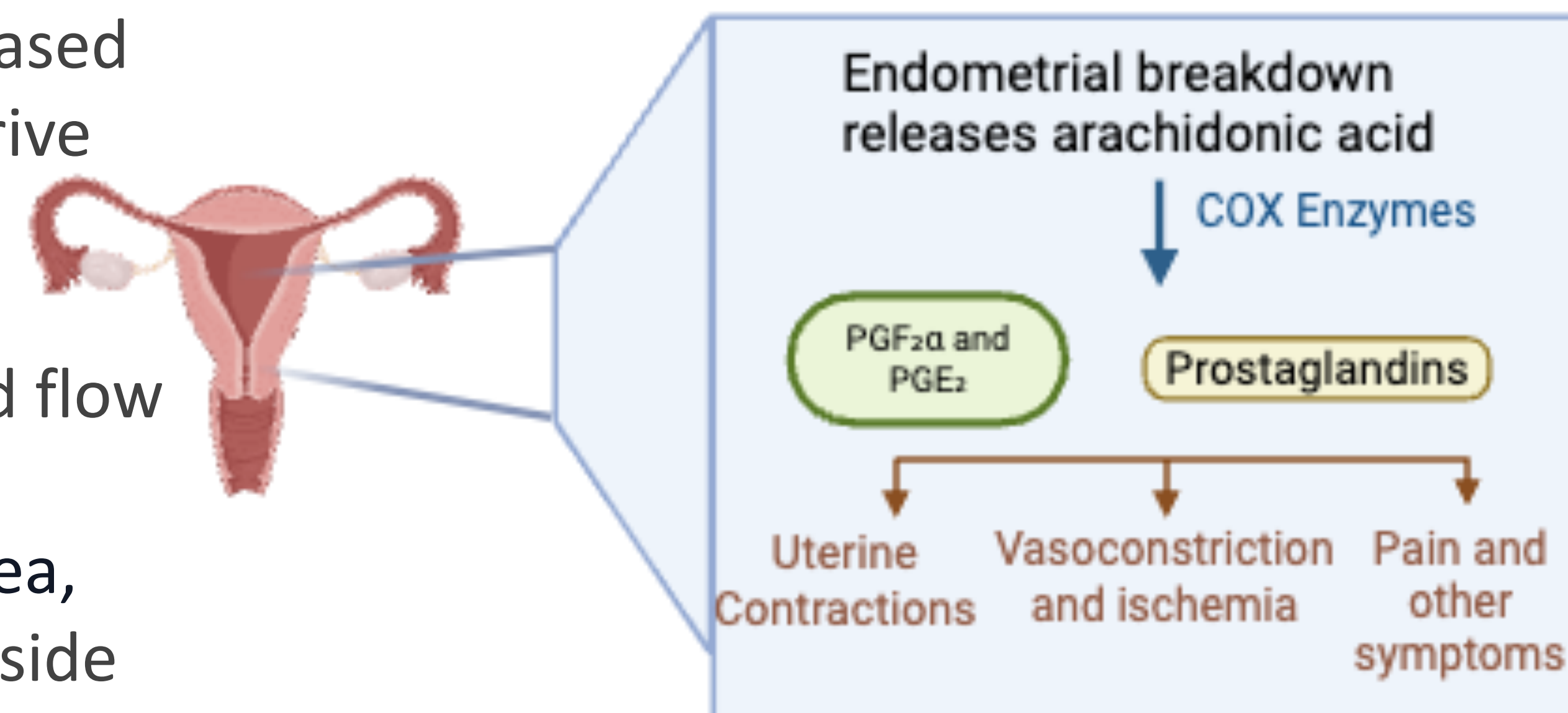
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Introduction

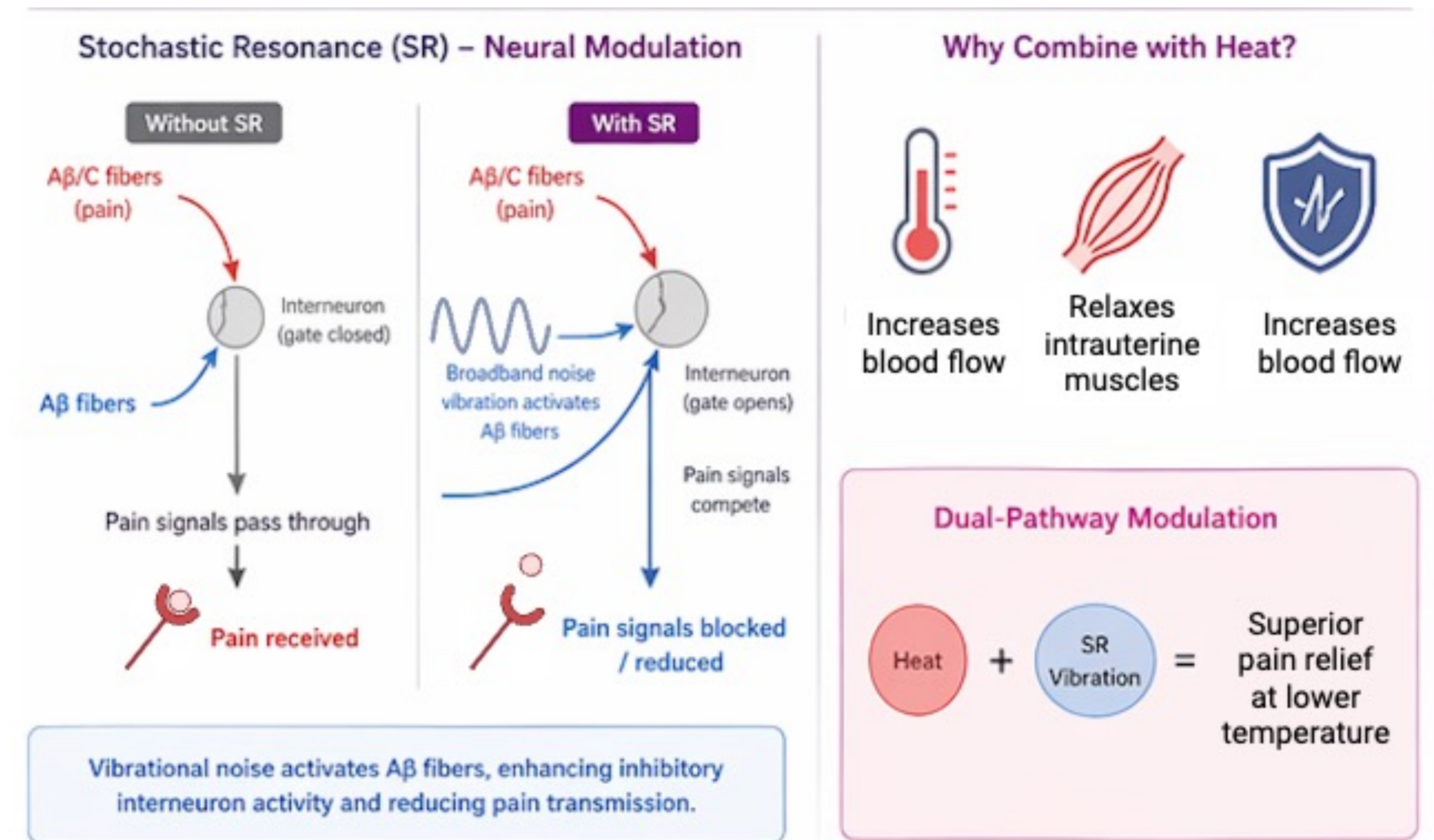
- Over 2 billion women menstruate monthly worldwide, with 90% experiencing dysmenorrhea (painful uterine cramping during menstruation).
- Dysmenorrhea is classified as primary (no underlying condition) or secondary (associated with an identifiable disease).
- 29% of affected individuals report severe pain, with symptoms including cramps, lower back pain, headaches, nausea, and vomiting.
- Dysmenorrhea significantly impacts quality of life, causing approximately 12% of monthly school and work activities to be missed.

Background

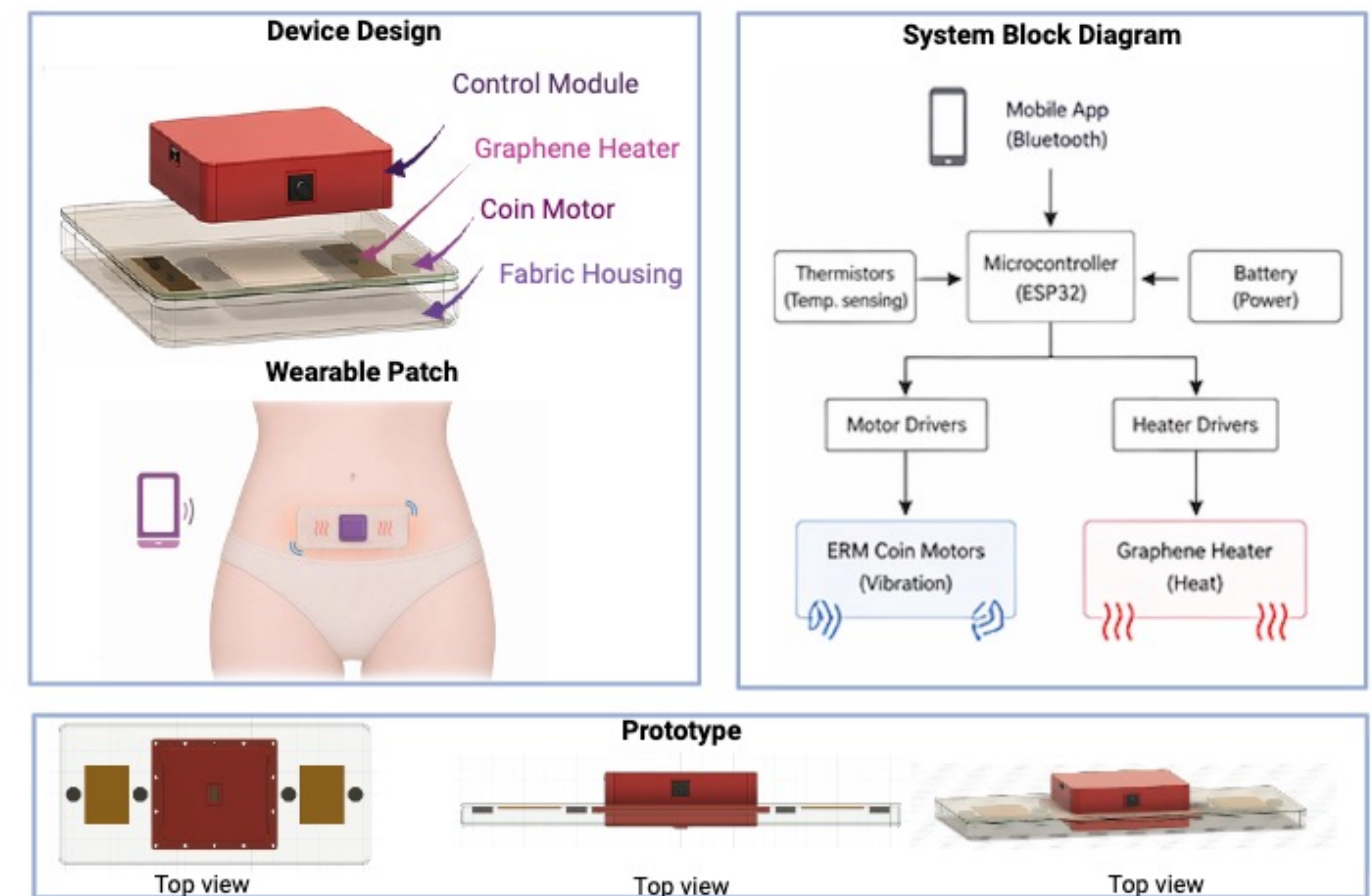
- Prostaglandins ($PGF_{2\alpha}$, PGE_2) released during endometrial breakdown drive symptoms
- Cause uterine contractions + vasoconstriction → reduced blood flow → ischemic pain
- Systemic circulation triggers nausea, headache, fatigue, diarrhea alongside cramping



Mechanism



Prototype Design + System Architecture



Current Treatment and Gaps

| NSAIDs | Oral Contraceptives | Hormonal Therapies | TENS | Heat Therapy (standalone) |
|---|--------------------------------|--------------------------------|---------------------------------------|---|
| | | | | |
| Incomplete efficacy (~18% non-responders) | Side effects, suppresses cycle | Significant side effect burden | Cumbersome electrodes, limited uptake | Passive, short-term relief. Risk of burns |

X All current therapies act AFTER pain onset and do not target upstream mechanisms or neural modulation

Significance and Future Work

First application of SR vibration for dysmenorrhea (novel, drug-free, hormone-free approach)

Empowers patient autonomy through app-controlled, adjustable therapy

Enables clinician integration via shareable therapy data for informed care decisions

Future Directions: Prototype optimization → IRB-approved pilot study → Patent filing & clinical trials → Expansion to other chronic pain applications