

## Problem Statement

Psychogenic numbness affects over 20% of adolescents, disrupting writing and school concentration. Existing manual remedies are slow and high-effort.

## Device Development Goal

The goal is to create a device that can **increase blood circulation by utilizing of vibration therapy**. With our device, the client will be able to **recover from numbness** and regain mobility of his arm.

Criteria:	Ranking
<b>Functional:</b>	
Return mobility to arm during episodes (L1)	10
Return function to arm in <15 min (L1)	10
Does not heat up excessively during use (L1)	10
Allows full range of motion for the arm when not in episode (L2)	8
Addresses psychogenic effects (L2)	5
Targets pressure points (L3)	3
<b>Physical:</b>	
Portable to move device around easily (L2)	7
Adjustable to fit different clients' arm (L3)	3
Quiet when functioning (L3)	6
Comfortable for extended periods of wear (L3)	6
Able to be cleaned (L3)	4
<b>Cost:</b>	
Under \$50 to produce (L2)	6
<b>User:</b>	
Able to use hand to maneuver during episode (L1)	7
Documentation:	
Manual/guide on how to safely use the device (L3)	6
Logbook for device creation is present (L3)	6

## Methods

### Wrist wraparound:

- Cut 2 fabric pieces (wrist-to-forearm length × min. circumference + 2 in.); sew 3-sided pockets for battery and motors onto one piece
- Layer second piece on top and sew the perimeter to seal; attach rough Velcro (~2 in.) on one end and smooth Velcro (~min. circumference) on the other



### Middle pad:

- Cut a 1.5 in. wide strip (mid-wraparound to below finger joints) and sew it to the right side of the wraparound
- Cut a 0.5 in. wide strip long enough to wrap under the finger joints; sew its midpoint to the palm pad and attach Velcro to each end (rough side up, smooth side down)
- Sew 3-sided pockets for wiring and motors onto a fabric piece, then seal with a second layer sewn around the perimeter

## Past Prototypes



Figure 1: *Vibration Sleeve Design*. Cons: The fabric was bulky and caused sweating.

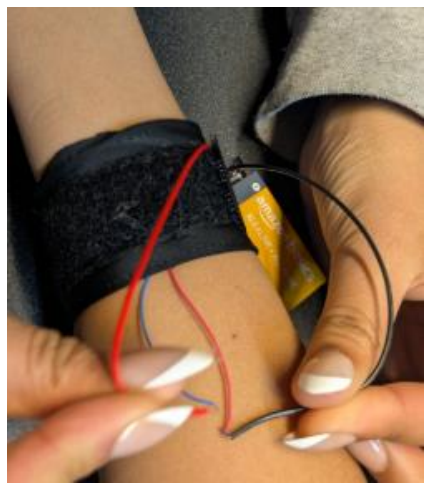


Figure 2: *Targeted Nerve Bracelet*. Cons: Doesn't target the whole arm.



Figure 3: *Dowel Sleeve Design*. Cons: The compression was not as effective as the vibration.

## Our Design

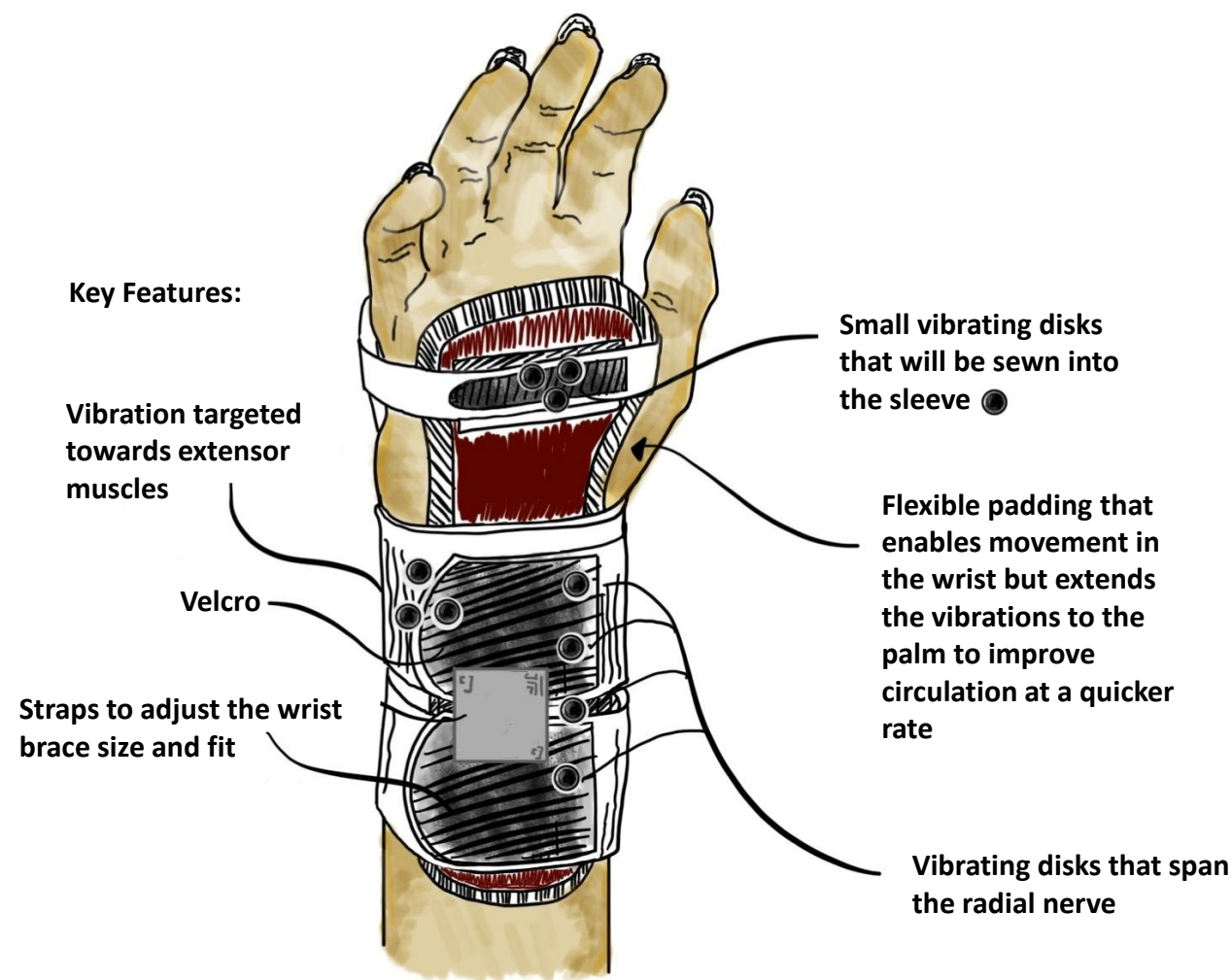


Figure 4: *Final Full Vibration Sleeve Sketch*. Details key features and visual representation.

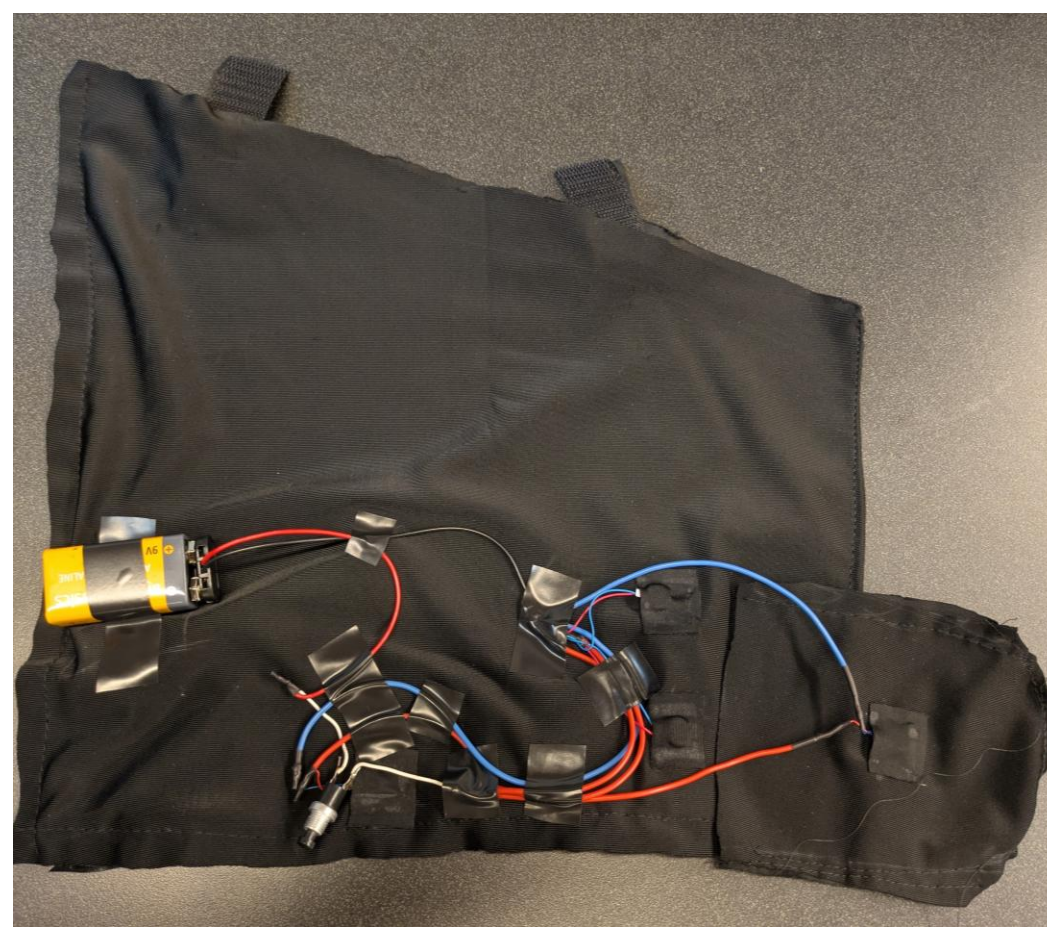


Figure 5: *Final Full Vibration Sleeve Internal Image*. Shows wiring, battery, vibration motors, and hand and palm sleeves.



Figure 6: *Final Full Vibration Sleeve Front Image*. Shows the front view of the sleeve while on an arm.

## Design Studies

### Temperature of Device Over Time

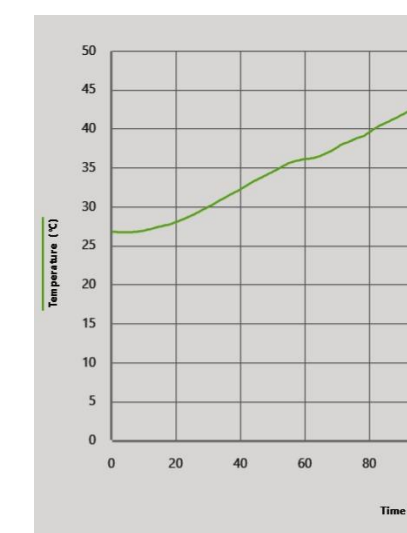


Figure 7: *Temperature of Device Over Time*. Temperature increase of one vibration motor over 3 cycles of 15 seconds of vibration and 10 seconds of cooldown. The graph follows a linear progression by equation  $y = -0.06374x + 27.16$ . The total increase in temperature was 5 degrees Celsius, showing that our device does not drastically increase in temperature.

### Arm Weakness of Client Over Time

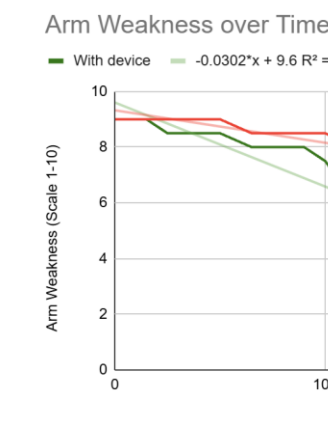


Figure 8: *Arm Weakness of Client Over Time*. The client rated the numbness of his arm during an episode on a scale of 1-10, once with the device, and once without. The data with the device follows a linear progression by equation  $y = -0.0302x + 9.6$ . The devices reduces the client's arm's numbness from 9/10 to 1/10 within 300 seconds. Without the device, the client's arm's numbness decreases from 9/10 to 6/10 within 300 seconds.

## Competitors



Figure 9: *Insight Timer Competitor*. A meditation app that helps the mental aspect of the psychogenic aspect of paresthesia.



Figure 10: *TouchPoint Wristband Competitor*. Tracks heartbeat and other physical identifiers to identify an episode.



Figure 11: *Compression Sleeve Competitor*. General athletic compression sleeve that improves blood flow.

## Conclusions

A vibration sleeve can effectively help reduce hemovisualization-related psychogenic paresthesia in Client S when compared to waiting for weakness to reduce over time.

## Future Work

- Auditory cue to initiate vibration
- EMGs to trigger vibration
- Slimmer design
- Adaptable for multiple arm locations (forearm, upper arm, shoulder)

## Citations

Be Visible Sports. (n.d.). *Arm compression sleeves — black*. Be Visible Sports. <https://www.bevisiblesports.com/products/arm-compression-sleeves-black>

Bhatia, M. (2015). Psychogenic lingual paresthesia. *Journal of Clinical and Diagnostic Research*, 9(5), VD04–VD05. <https://doi.org/10.7860/jcdr/2015/11916.5897>

Insight Network Inc. (2026). *Insight Timer—Meditate, Sleep* (Version 15.0) [Mobile app]. Apple App Store. <https://apps.apple.com/ai/app/insight-timer-meditate-sleep/id337472899>

TheTouchPoint Solution. (n.d.). *How TouchPoints work*. Retrieved May 13, 2026, from <https://www.thetouchpointsolution.com/pages/how-it-works>