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Functional Pillow

Our topic for the project is to create a temperature-changing pillow with haptic feedback to enhance sleep comfort. This would automatically change to a person's preferred temperature so that they can sleep more comfortably. Our objectives are to implement an adjustable cooling and heating mechanism, to add gentle haptic feedback to promote relaxation, use good skin-friendly materials for the pillow, and ensure it's easy and safe to use.

When developing a higher fidelity prototype there are many aspects we must consider. One aspect is the technology used to implement these features. For the temperature control we could use a thermoelectric heating/cooling system (Peltier modules). This can transfer heat away or towards the pillow based on the electric current. We will integrate conductive elements throughout the pillow like carbon fiber to distribute the temperatures. We would also integrate some temperature sensors to adjust it. For the vibration we would use some type of motor. We would use a battery to power the devices this would eliminate the use of external wires making it portable and easier for travel.

Another is deciding the type of fabric is best to build the pillow. The fabric should be breathable, comfortable, and works well with the temperature regulating system. With this in mind, bamboo is a good fabric choice for the external lining of the pillow. Bamboo fabrics are soft, fine, and comfortable; they also have good breathability. The only downside of using bamboo fabric is their expensive price. They are more expensive than other fabrics due to the

longer production methods. For the inside we can use ventilated memory foam. This will provide comfort while working well with the technology.

Since we are working with batteries and electricity, safety is an important aspect of this design. Using a low-voltage power source such as a lithium ion battery can have features such as overheat protection, including a thermal cutoff that will shut down the heating if it exceeds a certain/set temperature. If there are any wires built into the pillow, it would be beneficial to use materials such as silicone coated wiring and flame retardant foam to minimize any risks.

We can also include haptics for sleep enhancement. Having haptics for soft vibrations has various benefits, such as for relaxation and promoting better sleep. Another great feature using haptics would be the ability to use it as a silent alarm. It could gradually increase the speed of the vibrations to wake the user naturally from their sleep.

An app would also be most ideal for this pillow, because that is where users could customize the settings to their preferences.

When we construct an initial version of our temperature-adjustable haptic feedback pillow, we will use simple materials that mimic the functionalities required without requiring advanced technology.

Three major materials for this low-fidelity prototype are as follows:

Gel Packs (Reusable Hot/Cold Packs)

In place of a Peltier module, we can use gel packs that can be hand-heated or cooled. These will act in place of the temperature-changed function of the final product.



Cotton Fabric or Fleece

For the pillowcase, we will use cotton or fleece material. They are soft and possess a snug outer covering for testing. This simulates the bamboo fabric we will use in our finished product, as it is soft, breathable, and snug. It also automatically regulates temperature, which will suit the heating and cooling system.



Phone with Vibration Mode

To test the haptic feedback functionality, we can use a smartphone inside the pillow to test how the vibration feels and imitate the gentle haptic feedback the pillow will provide.



Works Cited

"Bamboo vs Cotton Fabric: Which One Is Better?" *Free Fly Apparel*,
<https://freeflyapparel.com/blogs/guide-post/bamboo-vs-cotton-fabric#:~:text=Cotton%20is%20certainly%20comfortable%2C%20but,home%20or%20out%20and%20about>. Accessed 25 Feb. 2025.

"Our Fabrics: Bamboo." *Nest Designs*, <https://www.nestdesigns.com/our-fabrics-bamboo>. Accessed 25 Feb. 2025.

"Our Fabrics: Bamboo." *Nest Designs*, <https://www.nestdesigns.com/our-fabrics-bamboo>. Accessed 27 Feb. 2025.

"Reusable Hot/Cold Pack 10 x 15cm." *St. John Ambulance Canada*,
<https://sja.ca/en/product/reusable-hot-cold-pack-10-x-15cm>. Accessed 27 Feb. 2025.

"Supima® Cotton Fabric by the Yard | Premium Softness." *Yardblox Fabrics*,
<https://www.yardblox.com/collections/supima-r-cotton>. Accessed 27 Feb. 2025.

"Vibration Mode" Images – Browse 468 Stock Photos, Vectors, and Video." *Adobe Stock*,
<https://stock.adobe.com/ca/search?k=%22vibration+mode%22>. Accessed 27 Feb. 2025.