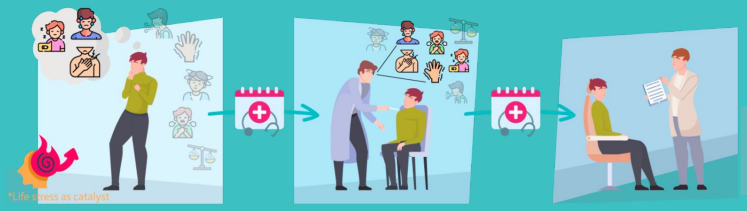
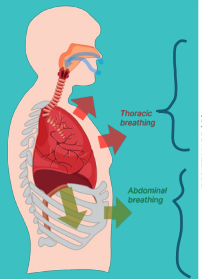
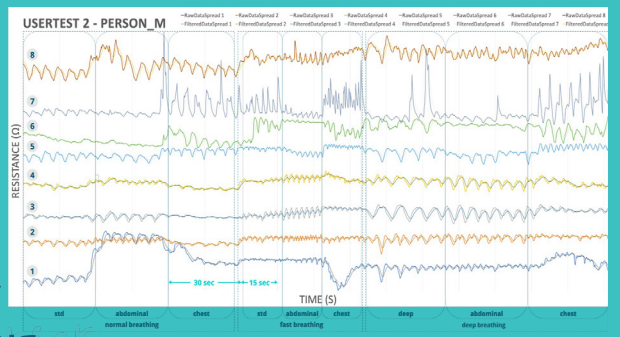
Knitted Breathing Sensors for Medical Wearables







This project aims to develop a wearable prototype capable of monitoring changes in breathing behavior by integrating textile sensors. Initiated by Mediventic, a healthcare start-up, the project targets simplifying the diagnosis and treatment of Chronic Hyper-ventilation Syndrome (CHVS) through affordable home-use smart clothing embedded with sensors.

Medical professionals stress the importance of wearable instruments for early detection and prevention of CHVS, which often presents unusual symptoms. To address this, the project explores the integration of sensors into smart textiles, preserving comfort and flexibility.

Through iterative development and user testing, the prototype demonstrates initial successes in real-time data collection of breathing behavior, with potential for further improvements in reliability and durability. The report discusses the outcomes in response to three design objectives.
Results regarding design objectives:

1. **Effectiveness of using knitted sensors for measuring breathing behavior**: The project confirms that real-time data collection related to breathing behavior is achievable, with readable results obtained even with basic prototyping components. The prototype successfully captures breathing patterns during various activities and positions, providing valuable information for interpreting an individual's breathing pattern. Improvements in sensor dimensions, electronics, and connections can enhance consistency and reliability.

2. **Impact of features on user experience**: Participants perceive the prototype positively and associate it with regular clothing, indicating potential social acceptability. User feedback on the comfort of the prototype varies, but overall, the experience is deemed acceptable. Suggestions for improvement include clear sensor calibration cues, variable sizing, and optimized strap placement.

3. **Manufacturing knitted sensors:** The study explores various materials and manufacturing methods for constructing textile systems. Experimental techniques are employed in prototyping, highlighting the challenges in creating durable electrical contacts between textiles and electronics. Recommendations are provided for future development, emphasizing the need for scalable techniques to improve data quality and evaluation.

The project's positive reception in the healthcare landscape suggests its potential application in other contexts, such as monitoring factors influencing sleep apnea. Overall, the project demonstrates the intricate relationship between utilizing medical knowledge to design wearables and generating medical knowledge through wearable development.

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Integrated Product Design

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