

# Enhancing Patient Compliance for Adolescent Idiopathic Scoliosis Bracing

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## Introduction

Adolescent Idiopathic Scoliosis (AIS) is a condition affecting 1-4% of adolescents, characterized by an abnormal lateral curvature of the spine. However, the effectiveness of bracing relies heavily on patient compliance, which is often compromised due to discomfort, visibility, and restrictions on daily movement. Research shows that adolescents wear their braces for only 33-77% of the prescribed hours, which diminishes treatment efficacy. Our project aims to address these compliance challenges by developing an AIS brace that maintains corrective pressure while improving user comfort and discretion. By focusing on design elements that minimize skin irritation and maximize mobility and concealability, this project seeks to improve adherence rates and, consequently, patient outcomes.

## Mission Statement

The project mission is to design a scoliosis brace that enhances patient comfort, discretion, and mobility, promoting higher compliance to improve outcomes in adolescent idiopathic scoliosis treatment.

## Customer Needs/Design Metrics

- Increased comfort to reduce skin irritation and pressure points
- Discretion, allowing the brace to be low-profile under clothing
- Ease of use with minimal daily adjustments required
- High mobility to support typical adolescent activities
- Lightweight and breathable materials for improved wearability
- Customizable fit to accommodate individual body shapes and growth

## Project Planning

Our project timeline details each development phase to ensure steady progress. The project began with research and needs assessment, focusing on understanding user requirements and benchmarking current AIS braces. This led into concept generation, where design specifications and selected materials were finalized. The current phase centers on iterative design and prototyping, allowing for testing and refinement to meet comfort and compliance targets. The final stages involve comprehensive testing and validation, followed by feedback-driven adjustments.

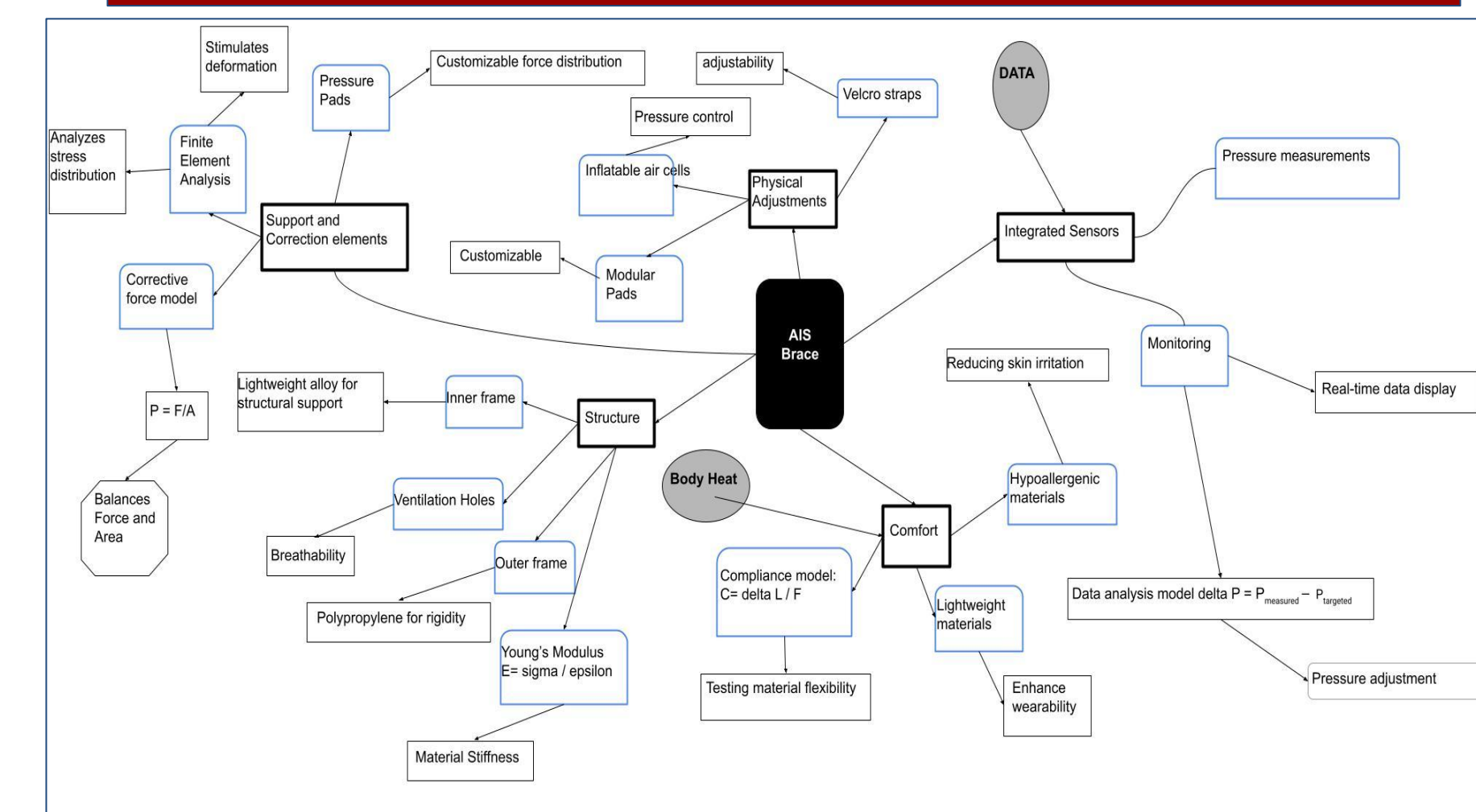
## Device Concept and Design

The AIS brace combines a rigid, lightweight polypropylene shell with breathable hypoallergenic foam for comfort and durability. Modular pressure pads and adjustable straps ensure customizable and precise corrective force distribution, with the choice of adding sensors monitoring therapeutic pressure ranges (500–2000 Pa) in real time. Ventilation holes enhance breathability, while the design accommodates growth and prioritizes sustainability for effective, patient-centered scoliosis treatment.

## Design for Manufacturing and Cost

The AIS brace combines 3D printing and CAD customization for a precise, personalized fit. The rigid Acrylonitrile Butadiene Styrene (ABS) shell costs \$50, with foam liners and modular pads adding \$20 and \$15. Adjustable Velcro straps cost \$10, while screen-printed or 3D-printed covers add \$25 for customization. At an estimated \$150 per brace without the sensors, the design balances affordability, comfort, and innovation.

## Product Architecture



## Final Product Specifications

The AIS brace features lightweight durability with adjustable pressure (500-2000 Pa) for spinal correction. The ABS shell, velcro straps, and ventilation holes ensure comfort and fit. Personalization options include pads, covers, and sensors.

## Design Status and Future work

The AIS brace is in the prototyping phase for testing stability, effectiveness, and comfort. For future work, further testing and enhancing material for durability. Personalization parts for more comfort and discretion.

## Acknowledgement

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