Intelligent Impact-Sensing Liner for Youth Female Athlete Safety

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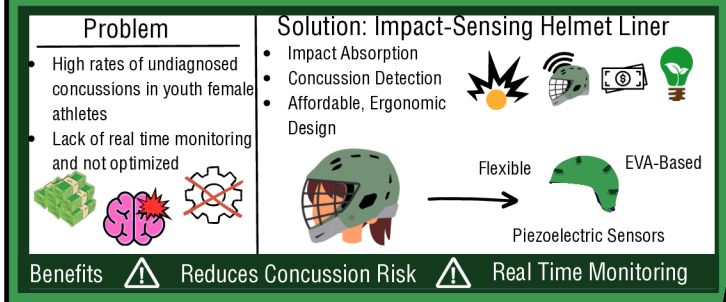
Engineering Problem → Female youth athletes have high concussion rates, but most helmets are designed for adult males, leading to poor fit, missed impacts, and higher injury risk.

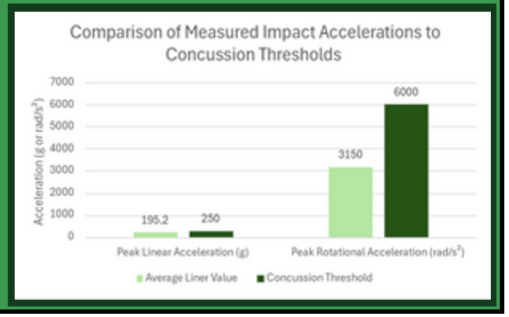
Engineering Objective → My goal is to design a low-cost helmet liner that fits adolescent female athletes, improves protection, and detects dangerous impacts.



A helmet liner that reduces and measures concussion risk can help prevent severe and repeated concussions.

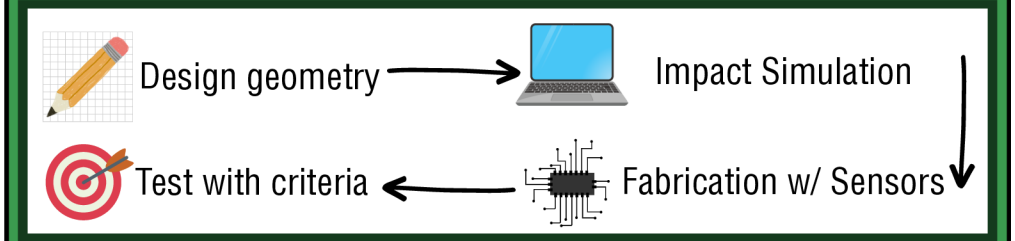
Data Analysis and Results

The analysis shows that the tailored liner design reduces peak linear and rotational accelerations well below concussion thresholds. Low variability across impacts indicates consistent energy absorption without liner bottoming out or harmful stress concentrations. All measured values remain below injury thresholds, validating the effectiveness of a youth, female specific liner with integrated impact detection.



Project Design with Major Criteria

My project design is a low-cost, youth- and female-specific helmet liner that integrates tailored foam geometry with embedded sensors to detect linear and rotational impact forces. The major criteria include effective energy absorption, accurate force detection, consistent fit with head variations, and structural integrity so the liner does not bottom out or form stress concentrations.



Interpretation and Conclusions

The data shows that the tailored liner design effectively reduces linear and rotational forces below concussion thresholds with consistent, reliable performance. This supports the conclusion that youth- and female-specific helmet liners can meaningfully improve safety at low cost. Next steps include fabricating a sensor-integrated prototype, validating it through drop and rotational testing, and refining the design based on experimental and user-fit results.