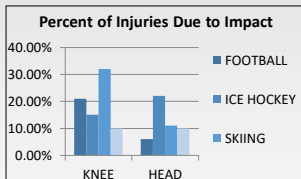


Background

Why it's important:

- Impacts make up a large fraction of sport injuries
- Traditional protective equipment is ineffective at distributing localized impact

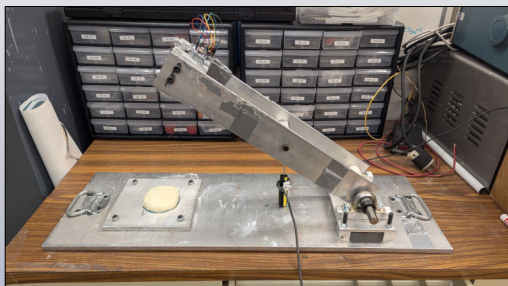


Goal

To make more effective slimmer protective equipment.

Methods

A metal block attached to an accelerometer was dropped onto samples including knee pads made by leading brands and measured the maximum deceleration.

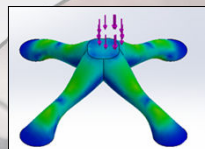


Micro Lattice

Micro Lattice compresses under force, decreasing acceleration and therefore decreasing the force applied to the body.

Design Elements:

1. Trusses are thin in the middle and wide at the edges
2. Lattice is constructed at a 45° and at the junction of four trusses to create pyramid structure.



Foam Layer

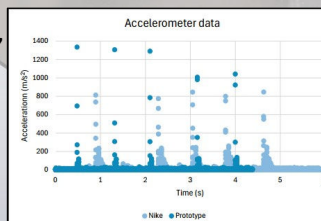
Foam layer to add extra padding and induces shear to help STF thicken.

Shear Thickening Fluid

Shear thickening fluid(STF) stiffens under sudden compression and helps to spread the force out so more impact is absorbed by Micro Lattice.

Results / Conclusion

When interpreting this data, a lower value indicates better performance. The results suggest that further research on the prototype's composition is necessary.



Sample	Control	Nike	Wilson	G-Form	Lattice plus STF
Acceleration Max (m/s ²)	1967	847	609	1752	1335
Normalized Data (m ⁴ /s ²)	N/A	0.1221	0.1305	0.508	0.1401

*Data normalized by multiplying the acceleration by the volume.

Future Work

1. Get injection molder to construct stronger and smaller lattices
2. Optimize way to contain lattice and shear thickening fluid.
3. Evaluate denser foams to use in protective equipment.
4. Integrate hybrid material in more protective equipment than just kneepads.

