

SYSTEM DESIGN OF A BIOFEEDBACK ACTIVE SENSOR SYSTEM (BASS)

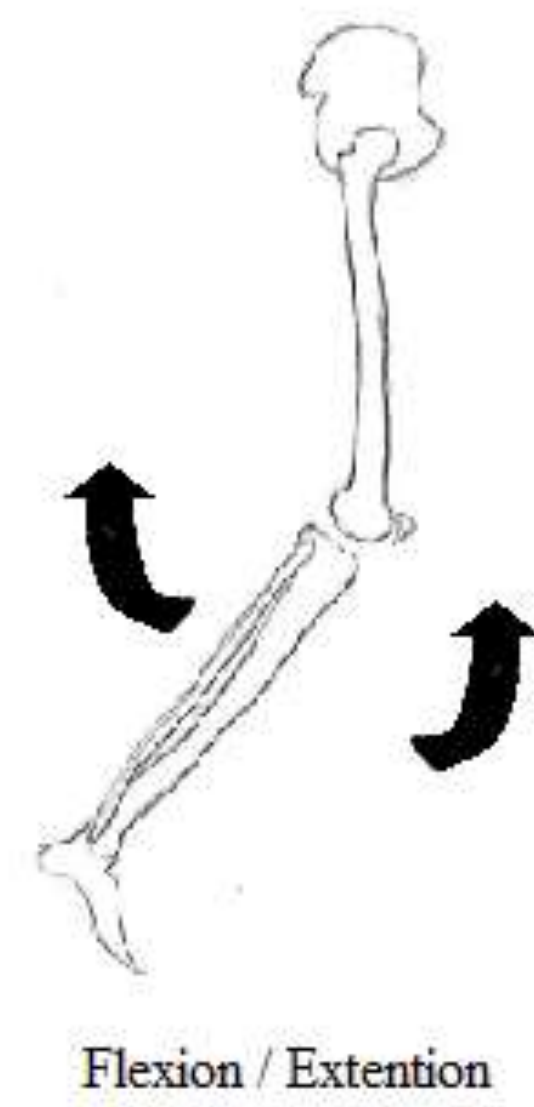
To Mitigate the Probability of Anterior Cruciate Ligament (ACL) Injuries

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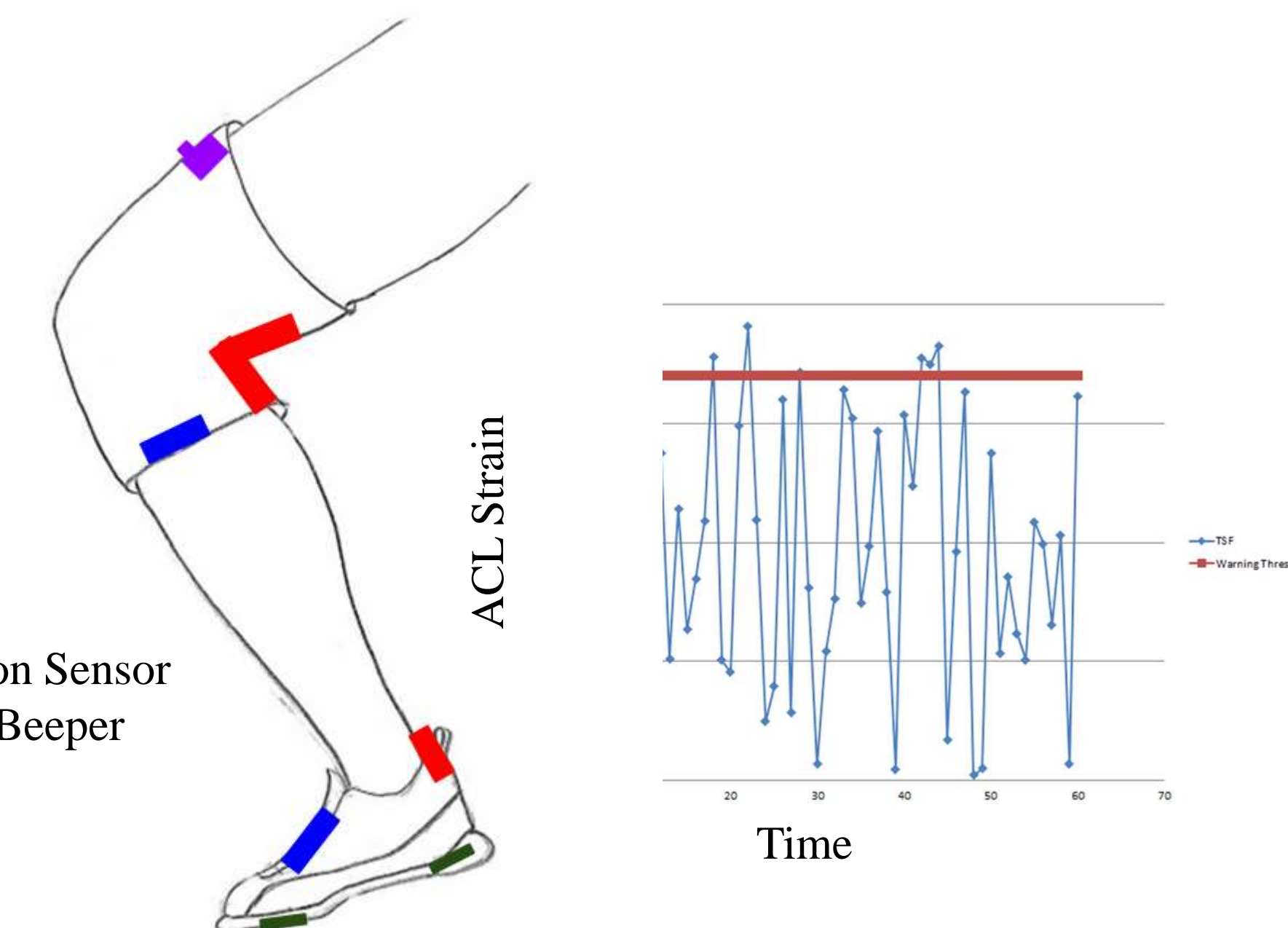
Context

- 300,000 ACL Injuries Per Year
- 13% of NCAA Athletes Tear Their ACL Per Year
- 44% Do Not Return to their Previous Level of Sport
- \$60,000 Per ACL Reconstruction;
\$2,000 Out of Pocket
- 37% of Non-Contact ACL Tears are Caused By Flexion/Extension

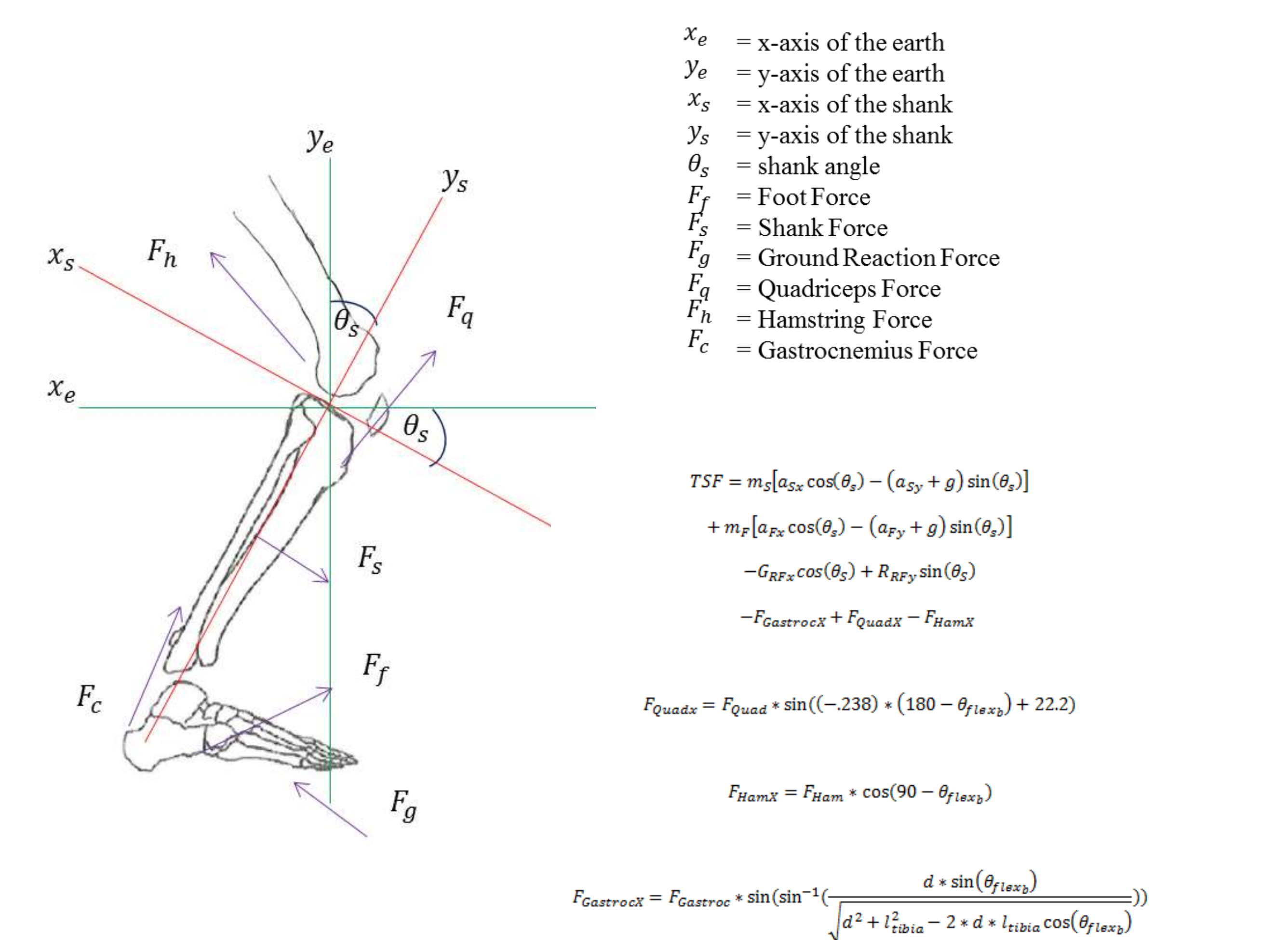


Need Statement & Alternative Con-Ops

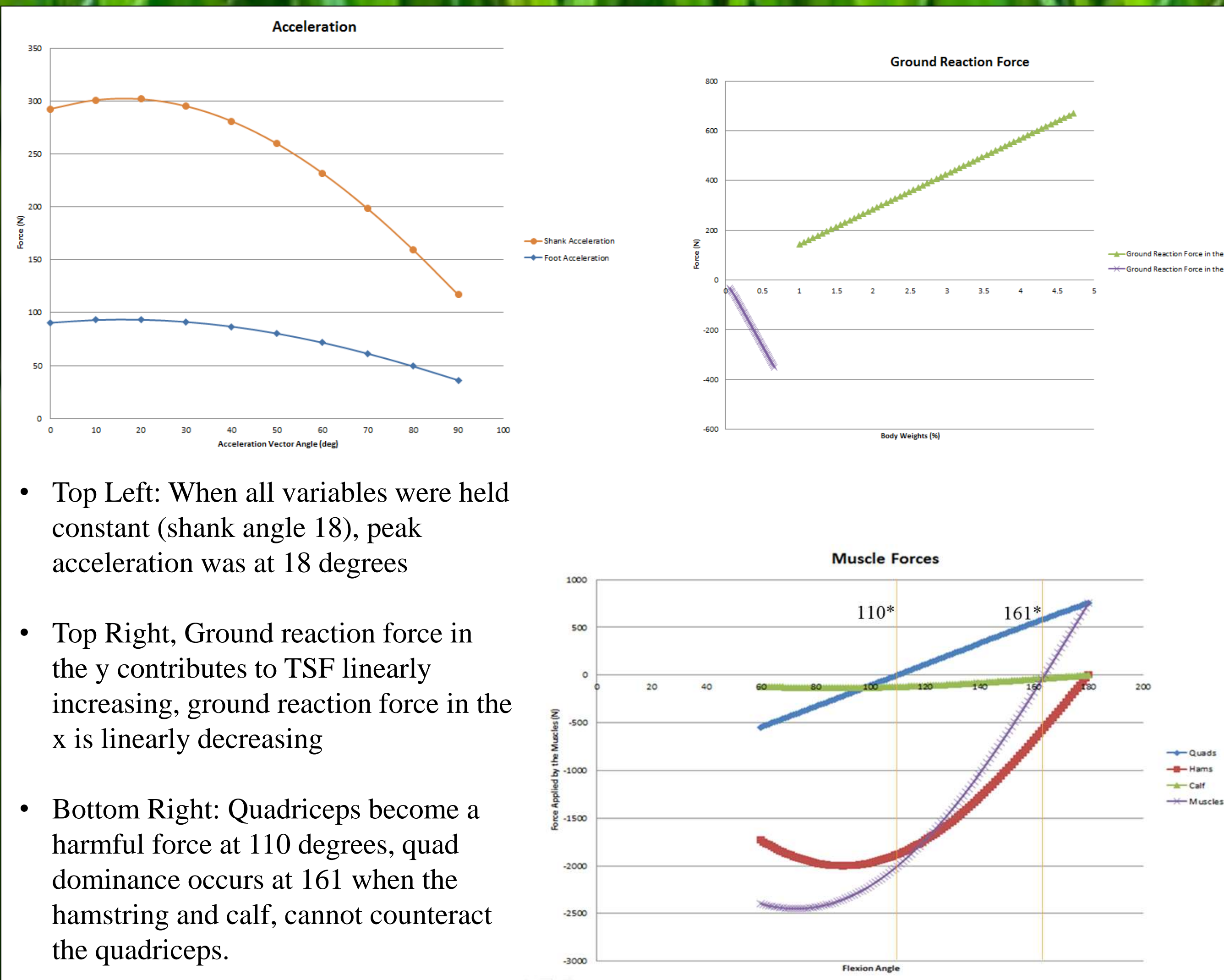
There is a need for a system that quantifies ACL strain and mitigates the probability of ACL tears.



Method of Analysis



Results



- Top Left: When all variables were held constant (shank angle 18), peak acceleration was at 18 degrees
- Top Right, Ground reaction force in the y contributes to TSF linearly increasing, ground reaction force in the x is linearly decreasing
- Bottom Right: Quadriceps become a harmful force at 110 degrees, quad dominance occurs at 161 when the hamstring and calf, cannot counteract the quadriceps.

Prototype Testing

Input		Output
Flexion	Ground Reaction	Beeeping
< 20 Deg	Low	No
< 20 Deg	High	Yes
> 20 Deg	High	No
> 20 Deg	Low	No

Good Form

Conclusions & Future Work

- \$600 Million Dollar Market Size
- Initial Investment \$500 Thousand
- Breakeven – 3 Months
- ROI – 18,000% after 5 years

	Flexion / Extension	Abduction / Adduction	Internal / External Rotation
Analysis	X	X	Next Step
Quantify	X	Next Step	-

Future work will consist of incorporating the other non-contact failure mechanisms, specifically abduction / adduction and flexion / extension