Science of Gold Medals

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Question: What makes one athlete the fastest, is it science or art?

In a ski race, all athletes start with the same height so should finish with the same velocity. So why is **ONE** skier the fastest?

I wanted to measure what made a good skier.

$$\Delta Velocity = \sqrt{\Delta Height * Gravity}$$

Fusion Motion Capture

I invented Fusion Motion Capture to measure snow sports. A traditional camera-based motion capture system was not practical because a ski area is too big.

Sensors are attached to the athlete's limbs, GPS is attached to the helmet **(below)** and pressure sensitive insoles fit inside the ski boots. The sensors, GPS and insoles measure different elements of the athlete's motion.

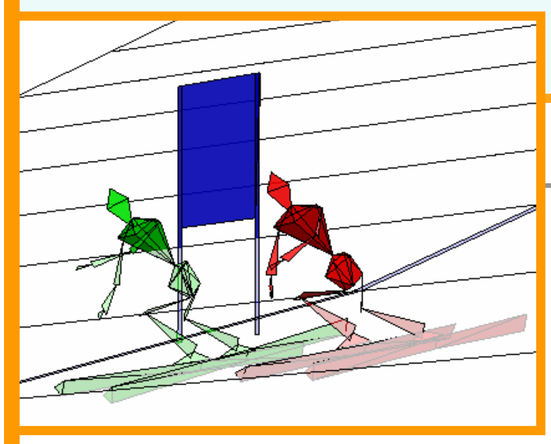
Above: Checking the system at Mt Ruapehu.

Results: New Zealand Team Member

I captured racing data from two NZ alpine ski team members. The poster background is data from two turns. Multiple ski runs were compared in a virtual ski-X race **(below)**.

The graph **(above)** is a complete run through 10 gates. In the top panel **green lines are accelerating** forces and **red lines are braking** forces. The effect on athlete speed is shown in the bottom panel. The turn at gate 7 is better than the turn at gate 6.

See more @: **www.youtube.com/BrodieMAD**



How to Ski Faster

Science tells us how to be a champion skier or snowboarder. It challenges traditional ski technique. The shortest path is not always the fastest, instead;

- Make efficient use of gravity with smooth turns,
- Lean into the turn early,
- Lean to the maximum the snow can hold,
- And have fun **(left)**.

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