



**CALIFORNIA STATE SCIENCE FAIR
2007 PROJECT SUMMARY**

Name(s) Alyssa M. Herman	Project Number J0213
Project Title Rolling Backpacks: Do They Really Reduce the Stress on Your Spine?	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals The goal of my experiment was to evaluate and compare the compression and twisting forces on the spine caused by the use of a rolling and regular backpack. I hypothesized that the use of a rolling backpack with a given book load would result in a lesser downward pressure and twisting force on the lower spine than use of a regular backpack.</p> <p>Methods/Materials I built a simple life size model of myself out of wood with wheels to allow travel and with shoulders and arms to hold a backpack. I modified the model to test two different forces. Model 1 was equipped with a weight scale at the region of the lumbar spine to assess downward force in pounds. In Model 2 the scale was replaced by a torque wrench to assess the twisting force in foot-pounds. Each model was tested over a distance fo 50 feet using first a regular backpack and then a rolling backpack carrying book loads of 0lbs, 10lbs, 20lbs, and 30lbs. Weight and then torque recordings were taken every 10 feet in each trial.</p> <p>Results Model 1: the control at 0lbs recorded 0lbs. For the rest of the book loads the weight recorded on the scale for the rolling backpack was always less than the regular backpack. Rolling to regular backpack recorded weight ratios were as follows: 10lb load (1:19), 20lb load (1:11), and 30lb load (1:9). Model 2: the control at 0lbs recorded 0 foot-pounds. For the rest of the book loads the torque recorded for the rolling backpack was always less than the regular backpack. Rolling to regular backpack recorded torque ratios were as follows: 10lb load (1:12), 20lb load (1:6), and 30lb load (1:5).</p> <p>Conclusions/Discussion The data from this experiment supported my hypothesis that use of a rolling backpack did in fact significantly reduce the downward pressure and twisting pressure on the region of the lumbar spine when compared to a regular backpack. Knowing these findings will likely influence a student's or parent's future choice of a backpack and hopefully result in less back pain and injury.</p>	
Summary Statement I evaluated the compression and twisting forces exerted at the lumbar spine region when using a rolling verses a regular backpack.	
Help Received My Father helped me build the experimental Models. My teachers Mr Demaria and Dr Dunn reviewed my project.	