



**CALIFORNIA STATE SCIENCE FAIR  
2007 PROJECT SUMMARY**

<b>Name(s)</b> Samantha A. Cutrone	<b>Project Number</b> <b>J1107</b>
<b>Project Title</b> <b>I've Got Your Back...Pack: The Effect of Backpack Use on Students' Spines</b>	
<p style="text-align: center;"><b>Abstract</b></p> <p><b>Objectives/Goals</b> I wanted to see if I could show that increasing the amount of weight of books placed in a student's backpack would increase the amount of pressure placed on the student's lower back and to see if different styles of backpacks made a difference in the amount of pressure on the back.</p> <p><b>Methods/Materials</b> Three different styles of store bought backpacks were used: Two fat strap with front buckle style (#1); single cross strap style (#2) and two skinny strap style (#3). Each of three subjects (seventh grade students) had MRI examinations of the lower back in the upright position in a Stand Up MRI machine both without backpack on (control) and with each backpack with 10 pound book weight and 20 pound book weight. The amount of compression of each intervertebral disc in the lower back was measured on each MRI examination.</p> <p><b>Results</b> With 10 pounds of book pressure on the spine, on average the discs compressed 22% while at 20 pounds of pressure, on average the discs compressed 30%. The upper portion of the lumbar spine (T12-L1 through L2-3 levels) compressed more with lower weight (10 lbs) than the lower part of the lumbar spine (L3-4 through L5-S1 levels) which compressed more with higher weight (20 lbs). The single cross strap backpack style caused the least compression while the two skinny strap style caused the most compression.</p> <p><b>Conclusions/Discussion</b> Increasing the amount of weight of books carried in a typical student's backpack increases the amount of pressure on the intervertebral discs of the spines. Since an increasing number of children report back pain as a complaint, backpack use may be a cause. Different styles of backpacks cause different amounts of compression. More styles of backpacks should be studied to find the method of carrying books that causes the least amount of pressure on the spine.</p>	
<b>Summary Statement</b> Increasing book weight carried in student's backpacks causes more compression of intervertebral discs.	
<b>Help Received</b> Used StandUp MRI machine at TrueMRI with MRI technologist and radiologist (my father)	