

About That Backpack

New Mexico

Supercomputing Challenge

Final Report

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Team 42

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Acknowledgements

Jill Miller

We would like to thank Jill Miller for helping us when we were not at school. She would help us at our house, pick us up, and take us where we needed to go, and was a great cheerleader at helping us get done.

Mrs. Glennon

I would like to thank Mrs. Glennon for being there for us and helping a lot. She never lost hope of going to the finals she also gave us really good tasting popcorn. She also dedicated her time by staying after school to help us on our project. We are glad she was our mentor.

Tom Laub

We would like to thank Tom Laub for being our programmer and instructor, he took his time to come over to our house and teach us C++. It was fun to be with him on the tour to Sandia Labs.

Executive Summary

As my friend and I were walking to the bus stop one day, we commented to each other how heavy our backpacks were. We noticed that other kids seemed to be carrying heavy backpack, also. We wondered if carrying a backpack that was too heavy would cause us to have an injury.

Forty million kids carry their backpacks to school each day with out knowing that they can permanently damage their backs. This is a big problem, because over twenty million kids carry an overweight backpack. “Backpack related injuries are up 300%,” says the CPSC.

We have developed a C++ model to help kid’s determine if their backpack is overweight, based upon how much they weigh. The model also determines their risk factor for developing back injuries, based on their age if their backpack is overweight. Research has shown that carrying an overweight backpack for numerous years can lead to back injuries.

Research

In our research we have found that if you carry a backpack on one shoulder, it can skew the way your back is naturally aligned. We learned that if you carry over 15% of your body weight, you are in danger of having back problems. If you carry a heavy backpack, your spinal disks can rupture.

When we interviewed Dr. Genter she told us that there are long term and short term problems. Some short term problems are pulled upper back muscles, shoulder muscles, and tendons and ligaments can also get injured. Long term problems are ruptured back disks, distorted spine, and long term pain. She also told us that you can hurt your back by lifting it wrong, wearing it wrong, and carrying to long. The longer you continue the bad habits, the more you increase your chances for problems.

The Code

```
//Backpack Program
#include <iostream>
#include <string>
using namespace std;

int main ()
{
float fifteenpercent=.15;
int personsweight;
int backpackweight;
int age;
int riskfactor;
float result;

cout <<"please enter your weight"<<endl;
cin >>personsweight;
cout <<"please enter your backpack weight"<<endl;
cin >> backpackweight;
cout <<"your backpack weight is:" << backpackweight<<"pounds" <<endl;
cout << "your backpack should not weigh more than:"
<<personsweight*fifteenpercent<<"pounds"<<endl;
result=personsweight*fifteenpercent;
if (backpackweight>result)
```

```

{

cout << "your backpack is too heavy. you need to lighten the load" <<endl;
  cout << "please enter your age, age must be between 6 and 18"<<endl;
  cin >>age;
  riskfactor=19-age;
  cout << "your riskfator is:"<< riskfactor<<endl;
  cout << "if your riskfactor is greater than 6 you are highly likely to experience injury"<<endl;
  system("pause");
}
else if (backpackweight<result)
{
  cout <<"your backpack weight is ok" <<endl;
  system("pause");
}
return 0;
}

```

Our program first asks you to enter your weight.

Next it asks you your backpack weight.

Then it will do a calculation and spit out the maximum your backpack should weigh.

It will either tell you your backpack weight is ok, or it will tell you your backpack is over weight, and you need to lighten the load.

After that it will ask you your age, between 6 and 18, then it will do a quick calculation (19-age), and output their risk factor.

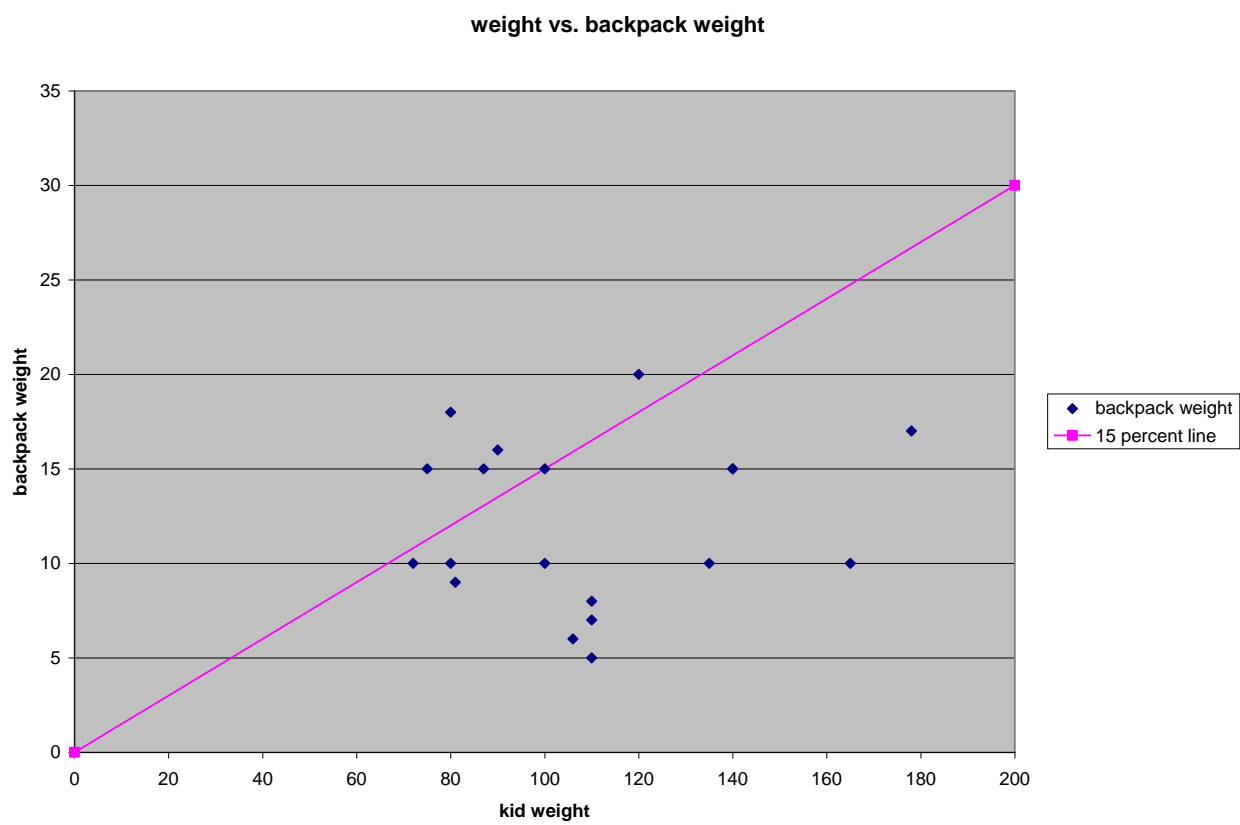
Any risk factor above a 4 will be considered a high risk factor predicted by their long term use.

Our program only considers the present conditions.

Results

Backpack Weight Data

6th grade Girl						
weight	weight w/backpack	# books	walk to school	time walk	back pain	1 or 2 shoulders
80	98	2			no	both
90	106	1			yes shoulders	both
165	175	7	yes	10 minutes	no	both
87	102	2			yes	both
75	90	2	yes	3 minutes	yes	both
80	90	2			yes	both
6th grade Boy						
weight	weight w/backpack	# books	walk to school	time walk	back pain	1 or 2 shoulders
140	155	2	no		no	sometimes 1
100	115	3	yes	10 minutes	no	both
106	112	1	yes	5 minutes	no	both
72	82	0	no		no	both
81	90	1	yes	12 minutes	no	both
120	140	2	yes	12 minutes	yes	both
8th grade Girl						
weight	weight w/backpack	# books	walk to school	time walk	back pain	1 or 2 shoulders
178	195	3	no		no	both
	130	0			no	both
	140	1	no	10 minutes	yes	both
	140	1			no	both
	160	1			no	both
	188	1	yes	15 minutes	no	cross shoulder
8th grade Boy						
weight	weight w/backpack	# books	walk to school	time walk	back pain	1 or 2 shoulders
135	145	0	no		no	both
110	117	0	yes	12 minutes	yes	both
140	155	1	yes	2 minutes	yes	both
110	118	7			yes	both
100	110	1			no	both
110	115	5			no	both



Significant, Original Achievement

Jay Miller

My significant achievement: I learned that backpacks that are wrongfully carried or have too much weight in them can hurt or permanently damage your back, or shoulders. Learning to program is a hard job. Doing a big project is way different than a small project. It takes much more time and research. Though it was a long process and sometimes hard, I enjoyed most of it.

Briceson Giaquinto

My significant achievement: I learned that Supercomputing Challenge is hard. I learned that is hard to do C ++ because you have to memorize the case sensitive. I learned that backpacks can be a hazard to people with a lot of 'stuff' in it; like a lot of text books and useless junk and folders. My conclusion is that Supercomputing Challenge is hard and fun at the same time.

Conclusion

Our data showed that 33% of the kids that we tested were carrying backpacks that were over weight for their body weight. Some kids were already experiencing back pain and at least one kid was carrying it over one shoulder. Research that has been conducted in this field of study has proven that carrying an over weight backpack can lead to injuries.

Our program and its calculations can be used to help kids make better decisions on lightening their backpacks, preventing them from having long term back problems.

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