



# CALIFORNIA STATE SCIENCE FAIR 2014 PROJECT SUMMARY

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<b>Project Title</b> <b>Sewing Science</b>	
<p style="text-align: center;"><b>Abstract</b></p> <p><b>Objectives/Goals</b> I am a self-taught seamstress, and I love to sew. The objective of my science project was to determine which stitch type makes the strongest seam and see how that strength varies with different thread and fabric types.</p> <p><b>Methods/Materials</b> In my experiment, I sewed seams in 120 different fabric samples and tested them to find the force at which the seam broke. I created samples with 4 different stitch types, 2 different thread types, and 3 different fabric types. I repeated each combination 5 times and analyzed the results. I built a custom setup that could apply up to 140 kg of force to pull the sewn samples to failure. For repeatability, I used an electric winch to apply tension at a constant rate and a slow-motion camera to record the exact failure point.</p> <p><b>Results</b> After measuring all my samples, I was shocked at how strong a single 4" (10 cm) wide sewn seam could be. Some of my samples broke at over 130 kg of force! For each sample, I calculated the force per unit length at which the seam failed. I also calculated the average force and the min and max error of each group of 5 data points. My results showed the weakest seam (at 3.91 kg/cm) was a 3 point zigzag stitch using polyester thread in denim fabric. A straight stitch with the same thread and fabric was almost 3 times as strong! The strongest seam (at 13.4 kg/cm) was a straight stitch using nylon thread in nylon fabric. This seam was almost 4 times stronger than the weakest!</p> <p><b>Conclusions/Discussion</b> My hypothesis that thread failure would occur with polyester thread was correct. My results also support my hypothesis that straight stitch was strongest. However, while my experimental results showed that straight stitch was, on average, the strongest, I cannot say conclusively because, taking measurement error into account, there was overlap with the stretch and zigzag stitches. I hypothesized correctly that fabric failure would occur in all the cases with nylon thread. I was incorrect that zigzag stitch was strongest. My results show that straight stitch, on average, was strongest. This result was conclusive in the case of nylon thread in denim fabric. But the other combinations were inconclusive due to overlapping measurement error.</p>	
<b>Summary Statement</b> For my science experiment this year, I decided to test which sewing stitch type makes the strongest seam and see how that strength varies with different thread and fabric types.	
<b>Help Received</b> My father supervised and assisted me with the use of power tools during the construction of my experimental setup.	